Engineering & Technology Education

Program of Studies
2014-2015

Learning that works for Kentucky
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Engineering & Technology Education

Course #	Course Title	Recommended Grade Level							Recommended Credit
	Middle School	6	7	8	9	10	11	12	
210101	Invention and Innovation	x	x	x					
210102	Invention and Innovation				x				½ (at 9th grade)
210103	Technological Systems	x	x	x					
210104	Technological Systems	x	x	x	x				½ (at 9th grade)
210105	Special Technology Topics	x	x	x					
210106	Special Technology Topics	x	x		x				½ (at 9th grade)
210119	Exploration of Power Energy & Transportation Technology	x	x	x					
210120	Exploration of Manufacturing Technology	x	x	x					
210121	Exploration of Construction Technology	x	x	x					
210122	Exploration of Computer & Graphic Communication Technology	x	x	x					
210127	Exploring Technology	x	x	x					
210128	Exploring Technology	x	x	x	x				½ (at 9th grade)
	Gateway To Technology Program (PLTW)								
219909	Design & Modeling*	x	x	x					
219910	Automation & Robotics*	x	x	x					
219911	Science & Technology*	x	x	x					
219912	Flight & Space*	x	x	x					
219913	Magic of Electrons*	x	x	x					
219914	Energy & the Environment*	x	x	x					
219915	Green Architecture*	x	x	x					
219916	Medical Detectives *	x	x	x					
	Middle school courses offered for 9th grade if housed at the middle school *could be multiple courses to be specifically designed as a feeder course to the high school engineering program								
	Engineering Technology High School Pathway:								
Course #	Course Title				9	10	11	12	
210107	Foundations of Technology				x	x			1
210108	Technological Design				x	x	x		1
210109	Technological Issues and Impacts					x	x	x	1
210110	Engineering Design (Capstone)							x	1
210111	Special Problems in Technology				x	x	x	x	1-4*
210112	Special Technology Topics				x	x	x	x	1-4*
210117	Advanced Design Applications						x	x	1
210118	Advanced Technological Applications						x	x	1
Course #	Course Title				9	10	11	12	Recommended Credit
210133	Graphic Communication Technology				x	x	x	x	1
210134	Material and Process Technology				x	x	x	x	1
210135	Production Technology						x	x	1-3*
210136	Introduction to Advanced Manufacturing				x				1

Course #	Course Title				9	10	11	12	
210137	Systems of Advanced Manufacturing					x			1
210138	Mechanical & Technical Design				x	x			1
210221	Fundamentals of Engineering Design I				x	x			1
210222	Engineering Design II					x	x	x	1
210223	Fundamentals of Architectural & Civil Engineering					x	x	x	1
210224	Principles of Engineering & Technology				x	x	x	x	1
210225	Introduction to Manufacturing & Manufacturing Systems				x	x	x	x	1
210226	Introduction to Aerospace				x	x			1
210229	Fundamental of Aerospace Engineering						x	x	1
210230	Fundamentals of Mechatronics				x	x	x	x	1
210231	Intro to Mining Engineering & Technology					x	x	x	1
210232	Electricity & Electronics Fundamentals				x	x	x	x	1
210233	Fundamentals of Aviation Science I				x	x			1
210234	Aviation Science II					x	x	x	1
210235	Introduction to Space System Engineering I						x	x	1-3*
210236	Space Systems Engineering II							x	1-3*
210237	Commercial Aviation Science							x	1-3*
210238	Foundations of Robotics				x	x			1
210239	Robotics Design Essentials & Systems				x	x	x	x	1
210240	Robotic Application Capstone							x	1-3*
210241	Introduction to Alternative Energy I				x	x			1
210142	Alternative Energy II					x	x	x	1
210341	Foundations of Energy				x	x	x		1
210290	Special Topics in Engineering				x	x	x	x	1-4*
210316	Leadership Dynamics Engineering & Technology				x	x	x	x	.5-1
210330	Engineering & Technology Co-Op						x	x	1-3*
	*One credit granted each time the course is successfully completed.								

Project Lead the Way High School Pathway to Engineering:

Course #	Course Title				9	10	11	12	
219901	Introduction to Engineering Design				x	x	x	x	1
219902	Principles of Engineering				x	x	x	x	1
219903	Digital Electronics					x	x	x	1
219904	Computer Integrated Manufacturing						x	x	1
219905	Civil Engineering and Architecture						x	x	1
219907	Aerospace Engineering						x	x	1
219908	Biotechnical Engineering						x	x	1
219906	Engineering Design and Development (Capstone)							x	1
219917	Special Topics in Engineering				x	x	x	x	1-4*
	*One credit granted each time the course is successfully completed.								

ENGINEERING & TECHNOLOGY EDUCATION

Overview of Engineering and Technology

An Engineering and Technology program should provide opportunities for students to gain the following knowledge, skills, and abilities:

- Apply creative problem solving, critical thinking, teamwork, leadership, acceptance of personal responsibility and other skills using a variety of resources (including information, tools, and materials) to identify/define/solve problems.
- Design, build, test, and modify products and solutions to problems.
- Develop a conceptual understanding of technological contexts (medical, agricultural, communication, transportation, power and energy, manufacturing, and construction) and engineering contexts (mechanical, structural, fluid, electrical, electronics, optical, thermal, biotechnical, and materials).
- Understand the interrelationship between the resource/input, process, output, and feedback elements of technological systems.
- Use contemporary technologies to communicate, process, manipulate, collect, and apply information to solve technical problems.
- Integrate and apply concepts from Kentucky Core Content to contemporary technology.
- Develop competencies in the safe and efficient use of tools, machines, materials, and processes.
- Identify opportunities, characteristics, and preparation requirements for current and emerging technological occupations.
- Explore entrepreneurship and its place within the free enterprise system as a means to becoming a self-sufficient individual.
- Understand and appreciate both the importance and the dynamic nature of technology.
- Prepare for the challenges of a dynamic world through gaining skills in technological literacy, leadership, and problem solving, resulting in personal growth and opportunity.

Career Pathways:

- *10.0100 - Graphic & Digital Communication Technologies*
- *14.0101 - Pathway to Engineering (PTE) Project Lead the Way*
- *14.0201 - Aerospace & Aeronautics Engineering*
- *14.2901 - Engineering & Technology Design*
- *14.7000 - Advanced Manufacturing*
- *15.0100 - Civil Architectural & Construction Technology*
- *15.0405 - Robotics & Automation*
- *15.1101 - Power-Energy Engineering & Related Technology*

Elementary School Program

School districts are encouraged to explore the concept of an engineering pipeline. This career pathway would facilitate exploration, the attainment of knowledge and skills necessary for informed participation and gainful employment in a technologically dependent society. This pipeline may include a recommended sequence of courses that would allow integration and interdisciplinary instruction of important concepts. Beginning this pipeline at the elementary level could help the students focus their learning. Two programs of study are offered through Project Lead the Way (PLTW) and International Technology & Engineering Educators Association (ITEEA).

Through **PLTW Launch**, Project Lead The Way's program for kindergarten through fifth grade, students learn important, future-changing lessons, like it's okay to take risks and make mistakes, and it's great to employ critical thinking. As teachers and students learn and discover together, education becomes far more engaging. Due to the exponential growth of technological development, current elementary students will be living in a world much different than that of their teachers. Technological literacy takes on even great importance for younger students. Early exposure to engineering and

technological concepts can provide a context for academic content that could prove helpful to student learning. **PLTW Launch** is set up in modules that follow the design process. Each 10-hour module is aligned to certain grade-level standards, and modules are presented in pairs that combine to create a thematic unit. Teachers and schools have the flexibility to bring on the modules that they want, when they want, at the grade level they want.

ITEEA Elementary curriculum **Engineering by Design (EbD)** is an integrative, elementary curriculum grades 3-5 designed to serve as a model and instructional resource for building a solid foundation in STEM education for all students. The material leverages technological design challenges in an environmental context as the focus for learning. Science and mathematics conceptual development is supported through strategic integration of key concepts and skills and, additionally, the Grand Challenges for Engineering identified by the National Academy of Engineering are used as a context for problem solving.

Implementation of Engineering and Technology at the elementary school level is best achieved through consultation and cooperation among elementary and Engineering and Technology teachers. Kentucky schools are encouraged to include these concepts at the elementary levels as possible. Please contact the Engineering Technology Education Program Consultant can further information and implementation.

Middle School Program

Engineering and Technology programs in the middle school provides an introduction to technology as a specific field of study and how it connects and applies skills from other academic disciplines. Students experience the design process as they invent devices to solve various problems. Students learn of system requirements, processes and controls as they wrestle with trade-offs due to design constraints. Students apply scientific and mathematical knowledge as they analyze data to predict performance. Students learn the proper and safe operation of some basic tools as their ideas begin to take shape. Through these experiences, students begin to understand the forces that drive our technological society and how these forces can be controlled and directed. Instructional approaches include problem solving/design briefs where students build projects, small/large group instruction, discussion, research, student presentations, and other successful pedagogy. Carefully designed curriculum for modular technology labs can also be an effective means of instruction. Schools are encouraged to include Engineering and Technology as an equal component of interdisciplinary team teaching. Engineering and Technology at the middle school level should include a local chapter of the Technology Student Association (TSA) and can incorporate many of the TSA activities within the curriculum.

An Engineering and Technology (middle school) course is generally offered for six to eighteen weeks for a single class period each day. Alternative schedules that provide for equivalent contact hours may also be implemented. A total program of Engineering and Technology consists of a minimum of three course offerings, one for each grade level (6-8). Additional courses are available for unique individual or team study.

Middle schools that feed into a high school that provides courses in the Pathway to Engineering (PTE), a Project Lead the Way program of study, may wish to consider offering the Gateway to Engineering program of study. These programs of study require a STEM agreement. The Gateway to Technology program of study consists of eight courses covering the multiple facets of the field of engineering. This program can be offered at various grade levels with the Design & Modeling and Automation as the required core courses with each course covering a different area of engineering.

High School Program

Engineering and Technology at the high school level is a broad based program addressing many aspects of our technologically dependent society through various contexts. Instructional activities provide students with knowledge and skills concerning the function and operation of various technological devices. The High School Engineering and Technology program also immerses the student in decisions concerning technology, analyzing the impacts and assessing various technological issues. These educational goals can be accomplished through a variety of means, including, but not limited to research and presentations, discussions, and field experiences. The design, construction, and testing of various projects using a variety of contexts is imperative for successful instruction in the engineering and technology program.

The Kentucky Curricular for Engineering and Technology includes eight pathways. These pathways address the Standards for Technological Literacy and are designed to result in technologically literate graduates. They achieve these goals, however, through different approaches with slightly different perspectives.

Although Project Lead the Way serves as the recommended model for fulfilling the Engineering pathway, the local school is not limited to using only PLTW materials. Similar programs developed by other organizations or locally written curriculum could be used. It is critical, however, that the adopted program meets the rigor, scope, and objectives outlined in the PLTW program.

Standard Based Curriculum

The courses for the Engineering & Technology Education Pathways are based on the Center for Advancement of Teaching Technology and Science (CATTS) as a subsidiary of the International Technology Education Association. These materials are a product of several years of development by a multi-state consortium. The CATTS curriculum serves as a national model for technology courses. Project Lead the Way is a not-for-profit corporation that has developed a carefully sequenced series of courses. It is a project-based curriculum that challenges students of all ability levels to use mathematical, scientific, and technological principles to solve real-world problems. Students will understand how technological systems relate to the economy, individual lifestyles, standards of living, and career choices. As a result, students will be well prepared for the rigorous college curriculum that leads to a career in engineering or related fields.

Kentucky Occupational Skill Standards

The Kentucky Occupational Skill Standards are the performance specifications that identify the knowledge, skills, and abilities an individual needs to succeed in the workplace. Identifying the necessary skills is critical to preparing students for entry into employment or postsecondary education. Because of the importance of skill standards, the Office of Career and Technical Education in conjunction with the Kentucky Association of Manufacturers, Toyota, Southern Regional Education Board, Alltech, Cumberland Valley Resources, Alliance Coal, Kentucky Oil & Gas Association, Department of Energy Development & Independence, Tennessee Valley Authority, Appalachian Electric Power, Ashland Oil, Home Builders Association of Kentucky, National Energy Education Development, LGE-KU, and various post-secondary institutions/advisors worked to develop a system to certify that students have attained the necessary skills for employment or postsecondary education. Standards were developed in the areas of Manufacturing, Aerospace and Aeronautics, Engineering and Technical Design, Power-Energy and Transportation. These standards described the necessary **occupational, academic,** and **employability** skills needed to enter the workforce or post- secondary education in specific career areas. There is an ongoing effort to continue to refine these standards by which exemplary Engineering and Technology Education Programs are evaluated and certified. The strength of these partnerships insures that curriculum meets industry specifications.

Student Organization

Participation in Technology Student Association (TSA) provides a vehicle for students to employ higher order thinking skills, to interact with industry individuals to further enhance their leadership skill through their participation in regional, state and national competitive events and local activities.

Engineering & Technology Education

Advanced Manufacturing CIP 14.7000.00	Recommended Courses	Elective Courses
Tests for Certification o Engineering KOSSA o Manufacturing KOSSA o National Manufacturing Badge o Master Cam Associate Level	**210107 -** Foundations of Technology **210225 -** Introduction to Manufacturing & Manufacturing Systems **210230 -** Fundamentals of Mechatronics **210232 -** Electricity & Electronics Fundamentals **210134 –** Material Process Technology **210135 –** Production Technology **210136 –** Introduction to Advanced Manufacturing **210137 –** Systems of Advanced Manufacturing	**210117-** Advanced Design Applications **210118 -** Advanced Technological Applications **210221 -** Fundamentals of Engineering Design I **210222 -** Engineering Design II **210231 -** Introduction to Mining Engineering and Technology **210111 –** Special Problems in Technology **210112 -** Special Technological Topics **210238 –** Foundations of Robotics **210239 –** Robotics Design Essentials and Systems **210224 -** Principles of Engineering and Technology **210341 –** Foundations of Energy **210290 -** Special Topics in Engineering **060112 –** Digital Literacy - Other Courses Approved by Engineering/Technology Consultant Related to Career Major
Engineering & Technology Design CIP 14.2901.00	Recommended Courses	Elective Courses
Tests for Certification o Engineering KOSSA o Autodesk Certified User o Autodesk Inventor Certified User o Autodesk Revit Architecture Certified Associate o Certified Solid Works Associate (CSWA) o ANSI o AutoCAD Civil 3D	**210138 –** Mechanical and Technical Design **210108 -** Technological Design **210110 -** Engineering Design **210221 -** Fundamentals of Engineering Design I **210222 -** Engineering Design II **210223 -** Fundamentals of Architectural and Civil Engineering	**210107 -** Foundations of Technology **210109 –** Technological Issues & Impacts **210117-** Advanced Design Applications **210224 -** Principles of Engineering and Technology **210111 –** Special Problems in Technology **210112 -** Special Technological Topics **210341 -** Foundations of Energy **210290 -** Special Topics in Engineering **210316 –** Leadership Dynamics Engineering & Technology **210330 –** Engineering & Technology Co-Op **210331 –** Engineering & Technology Internship **060112 –** Digital Literacy - Other Courses Approved by Engineering/Technology Consultant Related to Career Major

Aerospace & Aeronautics Engineering CIP 14.0201.00	Recommended Courses	Elective Courses

Tests for Certification
• Engineering KOSSA
• Transportation KOSSA
• FAA Certifications
  ○ Written Exam
  ○ Student Pilot Certificate
  ○ Private Pilot Certificate
  ○ Recreational Pilot Certificate
	210226 – Fundamentals of Aerospace
	210233 – Fundamentals of Aviation Science I
	210234 – Aviation Science II
	210235 – Introduction to Space Systems Engineering I
	210236 – Space Systems Engineering II
	210237 – Commercial Aviation Science
	210229 – Fundamentals of Aerospace Engineering
		210111 – Special Problems in Technology
		210112 - Special Technological Topics
		210117- Advanced Design Applications
		210290 - Special Topics in Engineering
		210224 - Principles of Engineering
		219902 – Principles of Engineering (PLTW)
		219901 - Intro to Engineering Design
		060112- Digital Literacy
		Other Courses Approved by Engineering/Technology Consultant Related to Career Major

Project Lead the Way (PLTW) Pathway to Engineering (PTE) CIP 14.0101.00	<u>**Required PLTW Core Courses**</u>	Elective Courses
Tests for Certification ○ Engineering KOSSA ○ Manufacturing KOSSA ○ National Manufacturing Badge ○ Autodesk Certified User ○ Autodesk Inventor Certified User ○ Autodesk Revit Architecture Certificate Associate ○ ANSI ○ AutoCAD Civil 3D	**This program of study requires a STEM agreement with PLTW** **219901** - Introduction to Engineering Design **219902** - Principles of Engineering **219903** - Digital Electronics	**219904** - Computer Integrated Manufacturing **219905** - Civil Engineering & Architecture **219906** - Engineering Design & Development **219907** - Aerospace Engineering **219908** - Biotechnical Engineering **219917** - Special Topics in Engineering **060112** – Digital Literacy - Other Courses Approved by Engineering/Technology Consultant Related to Career Major

Civil Architecture & Construction Technology CIP 15.0100.00	Recommended Courses	Elective Courses
Tests for Certification ○ Engineering KOSSA ○ Construction KOSSA ○ Autodesk Certified User ○ Autodesk Inventor Certified User ○ Autodesk Revit Architecture Certified Associate ○ Certified Solid Works Associate (CSWA) ○ ANSI ○ AutoCAD Civil 3D	**210107** – Foundations of Technology **210138 –** Mechanical and Technical Design **210221 -** Fundamentals of Engineering Design I **210222 -** Engineering Design II **210223 -** Fundamentals of Architectural and Civil Engineering	**210108** – Technological Design **210109** – Technological Issues & Impacts **210110** – Engineering Design **210111 –** Special Problems in Technology **210112 -** Special Technological Topics **210117** – Advanced Design Applications **210118** – Advanced Technological Applications **210341** – Foundations of Energy **210290 -** Special Topics in Engineering **210316** – Leadership Dynamics Engineering & Technology **210330 –** Engineering & Technology Co-Op **210331 –** Engineering & Technology Internship **060112** – Digital Literacy - Other Courses Approved by Engineering/Technology Consultant Related to Career Major
Power-Energy Engineering-Related Technologies CIP 15.1101.00	Recommended Courses	Elective Courses
Tests for Certification ○ Engineering KOSSA ○ Outdoor Power Equipment Technician Certifications	**210232** – Electricity and Electronics Fundamentals **210341** – Foundations of Energy **210242** – Introduction to Alternative Energy I **210243** – Alternative Energy II	**210107** – Foundations of Technology **210117** – Advanced Design Applications **210221 -** Fundamentals of Engineering Design I **210231** – Introduction to Mining Engineering & Technology **210111 –** Special Problems in Technology **210112 -** Special Technological Topics **210224** – Principles of Engineering Technologies **210290 -** Special Topics in Engineering **210316** – Leadership Dynamics Engineering & Technology **210330 –** Engineering & Technology Co-Op **210331 –** Engineering & Technology Internship **060112** – Digital Literacy - Other Courses Approved by Engineering/Technology Consultant Related to Career Major

Robotics & Automation CIP 15.0405.00	Recommended Courses	Elective Courses
Tests for Certification o Engineering KOSSA o Autodesk Inventor Certified User	**210238** – Foundations of Robotics **210239** – Robotics Design Essentials and Systems **210240** – Robotics Application (Capstone) **210224** – Principles of Engineering Technologies **210225** – Introduction to Manufacturing & Manufacturing Systems **210230** – Fundamentals of Mechatronics **210232** – Electricity & Electronics Fundamentals	**210111** – Special Problems in Technology **210112** - Special Technological Topics **210290** – Special Topics in Engineering **210118** – Advanced Technological Applications **210316** – Leadership Dynamics Engineering & Technology **060112** – Digital Literacy - Other Courses Approved by Engineering/Technology Consultant Related to Career Major
Graphic & Digital Communications Technologies CIP 10.0100.00	Recommended Courses	Elective Courses
Tests for Certification o Engineering KOSSA o Communication KOSSA o Autodesk Inventor Certified User o Certified Solid Works Associate (CSWA) o Adobe Certified Associate Dreamweaver Flash Photoshop o Microsoft Office Specialist (MOS) 3of 4 Access Excel Power Point Word	**210107** – Foundations of Technology **210108** – Technological Design **210118** – Advanced Technological Applications **210133** – Graphic Communication Technology **210138** – Mechanical and Technical Design **060112** – Digital Literacy	**210109** – Technological Issues & Impacts **210110** - Engineering Design **210111** – Special Problems in Technology **210112** - Special Technological Topics **210221** - Fundamentals of Engineering Design I **210112** – Special Technology Topics **210290** – Special Topics in Engineering **210316** – Leadership Dynamics Engineering & Technology - Other Courses Approved by Engineering/Technology Consultant Related to Career Major

Engineering & Technology Middle School Courses

Invention and Innovation
Valid Course Code
210101

Course Description
This course provides students with opportunities to apply the design process in the invention or innovation of a new product, process, or system, In this course, students will learn all about invention and innovation. They will have opportunities to study the history of Invention and Innovations, including their impacts on society. They will learn about the core concepts of technology, and about the various approaches to solving problem, including engineering design and experimentation. Students will apply their creativity in the invention and innovation of new products, processes, or systems, Finally students learn about how various Invention and Innovations impact their lives. Students participate in engineering-design activities to understand how criteria, constraints, and processes affect designs. Students are involved in activities where they learn about brainstorming, visualizing, modeling, constructing, testing, experimenting, and refining designs. Students also develop skills in researching for information, communicating design information, and reporting results. This course will make extensive use of a laboratory environment through a variety of instructional strategies.   This course may be 6 to 18 weeks in duration.

Content/Process

Students will:

- Define technology and use technological terminology correctly.
- Identify and become aware of ways technology has been used to satisfy human needs and environmental concerns.
- Evaluate the impacts of technological Invention and Innovations on people, society, culture, and the environment.
- Identify opportunities for problem solving.
- Develop and use problem solving and decision making skills (brainstorming, visualizing, modeling, constructing, testing, and refining, etc.) to invent, design, create, and modify devices and systems.
- Apply a problem-solving system.
- Implement elements of form and function to the design process.
- Use tools, machines, and materials in a safe, efficient, and effective manner.
- Identify and analyze current and emerging issues (e.g., ethical, social, legal, environ-mental, political, and privacy) related to technology.
- Describe intended and unintended impacts of the application of technological solutions.
- Identify appropriate and inappropriate applications of technology.
- Analyze how and why societal demands impact invention and innovation.
- Identify that a product, system, or environment developed for one setting may be applied to another setting. Understand that innovations are alterations of previous inventions.
- Understand the relationship between Technology and Creativity, and how it has resulted in Invention and Innovations.
- Understand and utilize the patent process.
- Explore employability and social skills relative to careers involving invention and innovation.
- Develop personal and professional leadership through association with KY TSA.
- Apply concepts from the Kentucky Core Content in the context of Technology Education.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.

Connections

- International Technology Engineering and Education Association (ITEEA)
- Kentucky Occupational Skills Standard Assessment (KOSSA)

Invention and Innovation
Valid Course Code
210102

Course Description: This course provides students with opportunities to apply the design process in the invention or innovation of a new product, process, or system, In this course, students will learn all about invention and innovation. They will have opportunities to study the history of Invention and Innovations, including their impacts on society. They will learn about the core concepts of technology, and about the various approaches to solving problem, including engineering design and experimentation. Students will apply their creativity in the invention and innovation of new products, processes, or systems, Finally students learn about how various Invention and Innovations impact their lives. Students participate in engineering-design activities to understand how criteria, constraints, and processes affect designs. Students are involved in activities where they learn about brainstorming, visualizing, modeling, constructing, testing, experimenting, and refining designs. Students also develop skills in researching for information, communicating design information, and reporting results. This course will make extensive use of a laboratory environment through a variety of instructional strategies. 6 to 18 weeks in duration.

Content/Process

Students will:

- Define technology and use technological terminology correctly.
- Identify and become aware of ways technology has been used to satisfy human needs and environmental concerns.
- Evaluate the impacts of technological Invention and Innovations on people, society, culture, and the environment.
- Identify opportunities for problem solving.
- Develop and use problem solving and decision making skills (brainstorming, visualizing, modeling, constructing, testing, and refining, etc.) to invent, design, create, and modify devices and systems.
- Apply a problem-solving system.
- Implement elements of form and function to the design process.
- Use tools, machines, and materials in a safe, efficient, and effective manner.
- Identify and analyze current and emerging issues (e.g., ethical, social, legal, environ-mental, political, and privacy) related to technology.
- Describe intended and unintended impacts of the application of technological solutions.
- Identify appropriate and inappropriate applications of technology.
- Analyze how and why societal demands impact invention and innovation.
- Identify that a product, system, or environment developed for one setting may be applied to another setting. Understand that innovations are alterations of previous inventions.
- Understand the relationship between Technology and Creativity, and how it has resulted in Invention and Innovations.
- Understand and utilize the patent process.
- Explore employability and social skills relative to careers involving invention and innovation.
- Develop personal and professional leadership through association with KY TSA.
- Apply concepts from the Kentucky Core Content in the context of Technology Education.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Technological Systems
Valid Course Code
210103

Course Description: This course is intended to teach students how technological systems work together to solve problems and capture opportunities. A system can be as small as two components working together (technical system/device level) or can contain millions of interacting devices (use system/network level). We often break down the macro-systems into less complicated micro-systems in order to understand the entire system better. However, technology is becoming more integrated, and systems are becoming more and more dependent upon each other than ever before. Electronic systems are interacting with natural (i.e., biological) systems as humans use more and more monitoring devices for medical reasons. Electrical systems are interacting with mechanical and fluid-power systems as manufacturing establishments become more and more automated. This course will give students general background on the different types of systems but will concentrate more on the connections between these systems.

The goals of this course can be accomplished in a laboratory environment through a variety of instructional strategies. Instruction can be enriched through participation in Kentucky Technology Student Association challenges.

This course may be 6 to 18 weeks in duration.

Content/Process

Students will:
- Define technological systems
- Apply concepts from the Kentucky Core Content in the technological systems context.
- Explore technological concepts and processes in the contexts of energy and power, information and communication, transportation, manufacturing, construction, medical, agricultural and bio-related technologies in emerging technological systems/sub-systems.
- Design, test, evaluate, and modify models within technological systems.
- Solve basic technological problems using tools, machines, materials, and processes in an applied project-based approach.
- Analyze current and emerging issues (e.g. ethical, social, legal, environmental, political, and privacy) related to a wide variety of technological systems.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for a future career in a technological world.
- Demonstrate and apply an understanding of technological systems and the relationships between the resources/input, processes, output, and feedback elements of these systems.
- Analyze the changing nature and impacts of a variety of technological systems.
- Identify current and emerging occupations related to a variety of technological systems.
- Develop personal and professional leadership skills through association with the KY TSA.
- Identify, analyze, and compare current and emerging jobs, careers, and occupations relating to a variety of technological systems.

Connections
- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Technological Systems
Valid Course Code
210104

Course Description: This course is intended to teach students how technological systems work together to solve problems and capture opportunities. A system can be as small as two components working together (technical system/device level) or can contain millions of interacting devices (use system/network level). We often break down the macro-systems into less complicated micro-systems in order to understand the entire system better. However, technology is becoming more integrated, and systems are becoming more and more dependent upon each other than ever before. Electronic systems are interacting with natural (i.e., biological) systems as humans use more and more monitoring devices for medical reasons. Electrical systems are interacting with mechanical and fluid-power systems as manufacturing establishments become more and more automated. This course will give students general background on the different types of systems but will concentrate more on the connections between these systems.

The goals of this course can be accomplished in a laboratory environment through a variety of instructional strategies. Instruction can be enriched through participation in Kentucky Technology Student Association challenges.

This course may be 6 to 18 weeks in duration.

Content/Process

Students will:
- Define technological systems
- Apply concepts from the Kentucky Core Content in the technological systems context.
- Explore technological concepts and processes in the contexts of energy and power, information and communication, transportation, manufacturing, construction, medical, agricultural and bio-related technologies in emerging technological systems/sub-systems.
- Design, test, evaluate, and modify models within technological systems.
- Solve basic technological problems using tools, machines, materials, and processes in an applied project-based approach.
- Analyze current and emerging issues (e.g. ethical, social, legal, environmental, political, and privacy) related to a wide variety of technological systems.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for a future career in a technological world.
- Demonstrate and apply an understanding of technological systems and the relationships between the resources/input, processes, output, and feedback elements of these systems.
- Analyze the changing nature and impacts of a variety of technological systems.
- Identify current and emerging occupations related to a variety of technological systems.
- Develop personal and professional leadership skills through association with the KY TSA.
- Identify, analyze, and compare current and emerging jobs, careers, and occupations relating to a variety of technological systems.

Connections
- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Exploring Technology
Valid Course Code
210127

Course Description: Students develop an understanding of the progression and scope of technology through exploratory experiences. In group and individual activities, student experience ways in which technological knowledge and processes contribute to effective design and solutions to technological problems. Students participate in design activities to understand how criteria, constraints, and processes affect designs. Brainstorming, visualizing, modeling, constructing, testing, and refining designs provide first hand opportunities for students to understand the uses and impacts of innovations. Students develop skills in communicating design information and reporting results. Participation in Kentucky Technology Student Association will greatly enhance instruction.
This course may be 6 to 18 weeks in duration.

Content/Process

Students will:

- Define technology.
- Identify and become aware of ways technology has been used to meet human needs in the   home, school, community, and workplace.
- Use technological terminology correctly.
- Explore technological concepts and processes in the contexts of communication, transportation, manufacturing, construction, power and energy, medical, agriculture and bio-related, and emerging technological systems.
- Develop and use problem solving and decision making skills to invent, design, and modify devices and systems.
- Use tools, machines, and materials in a safe, efficient, and effective manner.
- Gather, analyze, and communicate technical information by measuring, reading, and analyzing drawings and other technical sources.
- Develop technical writing skills using appropriate forms, conventions and styles to communicate ideas and information.
- Understand that computers and software are versatile tools used to collect, organize, process, and communicate information and ideas.
- Explore employability and social skills relative to careers.
- Develop personal and professional leadership through association with KY TSA.
- Apply concepts from the Kentucky Core Content in the context of Technology Education.
- Identify and implement the components of a systems model through demonstration.
- Analyze the evolution of technological systems and their impacts on society.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Exploring Technology
Valid Course Code
210128

Course Description: Students develop an understanding of the progression and scope of technology through exploratory experiences. In group and individual activities, student experience ways in which technological knowledge and processes contribute to effective design and solutions to technological problems. Students participate in design activities to understand how criteria, constraints, and processes affect designs. Brainstorming, visualizing, modeling, constructing, testing, and refining designs provide first hand opportunities for students to understand the uses and impacts of innovations. Students develop skills in communicating design information and reporting results. Participation in Kentucky Technology Student Association will greatly enhance instruction.   This course may be 6 to 18 weeks in duration.

Content/Process

Students will:

- Define technology.
- Identify and become aware of ways technology has been used to meet human needs in the   home, school, community, and workplace.
- Use technological terminology correctly.
- Explore technological concepts and processes in the contexts of communication, transportation, manufacturing, construction, power and energy, medical, agriculture and bio-related, and emerging technological systems.
- Develop and use problem solving and decision making skills to invent, design, and modify devices and systems.
- Use tools, machines, and materials in a safe, efficient, and effective manner.
- Gather, analyze, and communicate technical information by measuring, reading, and analyzing drawings and other technical sources.
- Develop technical writing skills using appropriate forms, conventions and styles to communicate ideas and information.
- Understand that computers and software are versatile tools used to collect, organize, process, and communicate information and ideas.
- Explore employability and social skills relative to careers.
- Develop personal and professional leadership through association with KY TSA.
- Apply concepts from the Kentucky Core Content in the context of Technology Education.
- Identify and implement the components of a systems model through demonstration.
- Analyze the evolution of technological systems and their impacts on society.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Special Technology Topics
Valid Course Code
210105

Course Description: Special Technology Topics allows the teacher to develop a course for in-depth exploration of technological topics. This course will allow students to gain a more comprehensive knowledge of a particular technology topic or explore specialized technology careers. This can be accomplished in a laboratory environment through a variety of instructional strategies. Instruction can be enriched through participation in Kentucky Technology Student Association challenges and/or Project Lead the Way-Gateway to Technology program materials.

The structure of this course is determined at the local level to address individual situations.

This optional/additional course may be 6 to 18 weeks in duration and may be taught at any grade level as appropriate.

Content/Process

Students will:
- Apply concepts found in the Standards for Technological Literacy.
- Apply concepts from the Kentucky Core Content in the context of Technology Education.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.
- Develop personal and professional leadership skills through association with KY TSA.
- Utilize the interactive (team) process for engineering design.
- Use instruments to collect and analyze data.
- Identify current and emerging careers related to technology
- Develop competencies in the safe, efficient, and effective use of tools, machines, materials, and processes.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Special Technology Topics
Valid Course Code
210106

Course Description: Special Technology Topics allows the teacher to develop a course for in-depth exploration of technological topics. This course will allow students to gain a more comprehensive knowledge of a particular technology topic or explore specialized technology careers. This can be accomplished in a laboratory environment through a variety of instructional strategies. Instruction can be enriched through participation in Kentucky Technology Student Association challenges and/or Project Lead the Way-Gateway to Technology program materials.

The structure of this course is determined at the local level to address individual situations.

This optional/additional course may be 6 to 18 weeks in duration and may be taught at any grade level as appropriate.

Content/Process

Students will:
- Apply concepts found in the Standards for Technological Literacy.
- Apply concepts from the Kentucky Core Content in the context of Technology Education.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.
- Develop personal and professional leadership skills through association with KY TSA.
- Utilize the interactive (team) process for engineering design.
- Use instruments to collect and analyze data.
- Identify current and emerging careers related to technology
- Develop competencies in the safe, efficient, and effective use of tools, machines, materials, and processes.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Exploration of Power Energy & Transportation Technology
Valid Course Code
210119

Course Description: This course and/or modules allows for exploration in the many phases of Power Energy and Transportation through hands-on activities and/or modules. This program of study facilitates STEM principles to be applied in real world situations. These units or modules make up areas of the basic core technology such as but not limited to, Aviation and Aerospace, Transportation Systems, Robotics Pneumatic/Hydraulic, Power and Energy, Mechanical, Electrical/Electronics and Research.

Content/Process

Students will:
- Apply concepts found in the Standards for Technological Literacy.
- Apply concepts from the Kentucky Core Content in the context of Technology Education.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.
- Develop personal and professional leadership skills through association with KY TSA.
- Utilize the interactive (team) process for engineering design.
- Use instruments to collect and analyze data.
- Identify current and emerging careers related to technology
- Develop competencies in the safe, efficient, and effective use of tools, machines, materials, and processes.
- Define the term of Technology
- Independently and cooperatively explore areas of technology related to power, energy and transportation systems in order to discover technical abilities career interest and future educational directions.
- Develop a safe and functional level of skill in the use of technological tools, machines, and instrumentation, material and processes.
- Understand and apply the technological method of inquiry and problem solving to produce and evaluate technological products and services.
- Recognize and appreciate the impact and potential of technology so that students can exercise some control over the uses and consequences of technology.
- Purposefully integrate core subject (math, science, history, English) matter in practical and technological life activities.

Connections
- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Exploration of Manufacturing Technology
Valid Course Code
210120

Course Description: An exploratory course and/or modules designed to investigate the types of activities performed in the manufacturing industry and through laboratory experiences students explore the skills and technologies of this industry. Content includes the application of technology; the design of products and services; emerging and innovative technologies; safety and maintenance of technology; marketing; technology-related; and career explorations. Activities may include computer aided drafting, manufacturing parts, CNC programming, computer control, and robotics while tools and machines and planning manufacturing projects.

Content/Process

Students will:
- Define the term of Technology.
- Apply concepts found in the Standards for Technological Literacy.
- Demonstrate an understanding of the history of manufacturing.
- Demonstrate an understanding of the history of the social impact of manufacturing.
- Describe the essential systems and processes involved in manufacturing.
- Identify materials and resources used in manufacturing.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.
- Utilize the interactive (team) process for engineering design.
- Use Instruments to collect and analyze data.
- Perform a pre-planned introductory manufacturing activity applying correct safety procedures, appropriate use of materials and processing operations.
- Identify current and emerging careers related to manufacturing technology.
- Develop a safe and functional level of skill, efficiency, and effective use of technological tools, machines, instrumentation, material, and processes.
- Understand and apply the technological method of inquiry and problem solving to produce and evaluate technological products and services.
- Purposefully integrate core subject (math, science, history, English) matter in practical and technological life activities.
- Students will develop leadership and interpersonal problem-solving skill through participation in co-curricular activities associated with KY-TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Exploration of Computer and Graphic Communication Technology
Valid Course Code
210122

Course Description: An exploratory course and/or modules designed to provide students the skills and knowledge that are performed in the computer and communication industries. The types of activities may include but not limited to developing images, photography, desktop publishing, computer aided design, mechanical drafting, and printing, computer animation, sublimation, screen printing, bindery, audio/video production, and file management through laboratory experiences.

Content/Process

Students will

- Apply concepts found in the Standards for Technological Literacy.
- Demonstrate an understanding of the history of scientific principles, and potential careers in the audio broadcasting industry.
- Develop an appreciation how communication technology has impacted our society.
- Create graphic design projects with the use of various software programs.
- Utilize the interactive (team) process for engineering design.
- Students will utilize basic principles of design through the use of mechanical drawing.
- Students will combine graphics, audio and video to create a multimedia presentation
- Explore design techniques and develop basic skills with the use of CADD programs.
- Identify current and emerging careers related to construction technology.
- Develop a safe and functional level of skill, efficiency, and effective use of technological tools, machines, instrumentation, material, and processes.
- Understand and apply the technological method of inquiry and problem solving to produce and evaluate technological products and services.
- Purposefully integrate core subject (math, science, history, English) matter in practical and technological life activities.
- Students will develop leadership and interpersonal problem-solving skill through participation in co-curricular activities associated with KY-TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Design and Modeling
Valid Course Code
219909

Course Description: Students will use solid modeling (a very sophisticated mathematical technique for representing solid objects) to introduce students to the design process. Utilizing this design approach, students understand how solid modeling has influenced their lives. Students also learn sketching techniques, and use descriptive geometry as a component of design, measurement, and computer modeling. Using design briefs or abstracts, students create models and documentation to solve problems.
Content/Process
Students will • Apply concepts found in the Standards for Technological Literacy. • Compare and contrast technology and science. • Describe impacts that technology has had on society. • Describe the design process and how it is used to aid in problem solving. • Utilize the interactive (team) process for engineering design. • Students will utilize basic principles of design through the use of freehand sketching. • Recognize thumbnail sketches, isometric, orthographic, one- and two-point perspective drawings and accurately interpret what they see. • Explore design techniques and develop basic skills with the use of CADD programs. • Identify current and emerging careers related to engineering. • Develop a safe and functional level of skill, efficiency, and effective use of technological tools, machines, instrumentation, material, and processes. • Understand and apply the technological method of inquiry and problem solving to produce and evaluate technological products and services. • Purposefully integrate core subject (math, science, history, English) matter in practical and technological life activities. • Describe how a prototype model is used and how its fabrication aid in the design process. • Students will develop leadership and interpersonal problem-solving skill through participation in co-curricular activities associated with KY-TSA.
Connections • Kentucky Technology Student Association (KY TSA) • Project Lead The Way • National Technological Literacy Content Standards • Kentucky Occupational Skill Standards (KOSSA)

Automation and Robotics
Valid Course Code
219910

Course Description: Students will use solid modeling (a very sophisticated mathematical technique for representing solid objects) to introduce students to the design process. Utilizing this design approach, students understand how solid modeling has influenced their lives. Students also learn sketching techniques, and use descriptive geometry as a component of design, measurement, and computer modeling. Using design briefs or abstracts, students create models and documentation to solve problems.		
Grade Level/s: 6-8	**Credit:** None	**Prerequisite:** None
Content/Process		

Students will
- Apply concepts found in the Standards for Technological Literacy.
- Compare and contrast technology and science.
- Describe impacts that technology has had on society.
- Describe the design process and how it is used to aid in problem solving.
- Utilize the interactive (team) process for engineering design.
- Develop an understanding of the various ways robots are used in today's world and the impact their use has on society.
- Investigate an engineering career and determine the requirements for entering the field.
- Investigate and understand various mechanisms to determine their purpose and applications.
- Understand and program open-loop and closed-loop systems.
- Develop a safe and functional level of skill, efficiency, and effective use of technological tools, machines, instrumentation, material, and processes.
- Understand and apply the technological method of inquiry and problem solving to produce and evaluate technological products and services.
- Purposefully integrate core subject (math, science, history, English) matter in practical and technological life activities.
- Students will develop leadership and interpersonal problem-solving skill through participation in co-curricular activities associated with KY-TSA.

Connections
- Kentucky Technology Student Association (KY TSA)
- Project Lead The Way
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

*Districts that offer the following Gateway Program of Study must have a
Project Lead The Way STEM agreement.*

**Science and Technology
Valid Course Code
219911**

Course Description: In this course students will trace how science has affected technology throughout history. Students learn about the mechanics of motion, the conversion of energy, and the use of science to improve communication.		
Grade Level/s: 6-8	**Credit:** None	**Prerequisite:** None
Content/Process		

Students will
- Apply concepts found in the Standards for Technological Literacy.
- Compare and contrast technology and science.
- Describe impacts that technology has had on society.
- Describe the design process and how it is used to aid in problem solving.
- Utilize the interactive (team) process for engineering design.
- Compare and contrast kinetic and potential energy.
- Investigate an engineering career and determine the requirements for entering the field.
- Investigate an engineering career and determine the requirements for entering the field.
- Identify and explain the function of systems and subsystems.
- Investigate and understand various mechanisms to determine their purpose and applications.
- Identify the six simple machines and explain their applications.
- Classify energy sources as renewable and nonrenewable.
- Develop a safe and functional level of skill, efficiency, and effective use of technological tools, machines, instrumentation, material, and processes.
- Understand and apply the technological method of inquiry and problem solving to produce and evaluate technological products and services.
- Purposefully integrate core subject (math, science, history, English) matter in practical and technological life activities.
- Explain the environmental impact of future career opportunities within the energy field.
- Students will develop leadership and interpersonal problem-solving skill through participation in co-curricular activities associated with KY-TSA.

Connections
- Kentucky Technology Student Association (KY TSA)
- Project Lead The Way
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Flight and Space
Valid Course Code
219912

Course Description: In this course students learn about the history of flight through hands-on activities, research, and a presentation in the form of an infomercial. In the Aeronautics unit students learn the science and art of flying through the air. Students will experience activities related to Newton's laws, Bernoulli's principle, wind tunnels, airfoils, and propulsion systems. Students will complete activities while learning about the history and principles of space travel. They will study the development of rocketry and the space program.

Content/Process

Students will

- Apply concepts found in the Standards for Technological Literacy.
- Compare and contrast technology and science.
- Describe impacts that technology has had on society.
- Describe the design process and how it is used to aid in problem solving.
- Work as an engineering team to construct a model, fly it safely, and make predications, observations, and comparisons of flight data.
- Apply knowledge of research to learn about an aerospace vehicle.
- Investigate an engineering career and determine the requirements for entering the field.
- Experience the flight characteristics of kites, whirly gigs, model airplanes, hot air balloons, and model rockets.
- Utilize proper data collection skills and language arts skills in engineering notebook entries.
- Describe Newton's Three Laws of Motion and how they relate to propulsion.
- Make calculations of flight performance and relate Newton's Three Laws of Motion to height the craft achieved.
- Investigate how changes in various design characteristics of an aircraft or rocket will affect flight performance.
- Develop a safe and functional level of skill, efficiency, and effective use of technological tools, machines, instrumentation, material, and processes.
- Purposefully integrate core subject (math, science, history, English) matter in practical and technological life activities.
- Students will develop leadership and interpersonal problem-solving skill through participation in co-curricular activities associated with KY-TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- Project Lead The Way
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Magic of Electrons
Valid Course Code
219913

Course Description: In this course students explore the science of electricity, the movement of atoms, circuit design, and sensing devices. Students acquire knowledge and skills in basic circuitry design and explore the impact of electricity on our lives.

Content/Process
Students will • Apply concepts found in the Standards for Technological Literacy. • Compare and contrast technology and science. • Investigate an engineering career and determine the requirements for entering the field. • Demonstrate the movement of electrons and electro-negativity in atomic structure diagrams. • Utilize proper data collection skills and language arts skills in engineering notebook entries. • Explain the differences between static electricity and current electricity • Measure conductivity levels of various materials using a digital multi-meter and classify them as conductors or insulators. • Explain what part the electrons, protons, and neutrons of an atom play the generation of electricity. • Explain the term *electromotive force* and the parts that make up a motor. • Demonstrate knowledge of DC motor operation by explaining how electricity is generated. • Use schematic symbols to diagram electric and electronic circuits. • Test and prove the relationship between voltage, current, and resistance as stated in Ohm's Law. • Understand common electric and electronic load devices, their schematic symbols, and describe the function of each device. • Describe the use of a transistor and its use as a switch or amplifier. • Develop a safe and functional level of skill, efficiency, and effective use of technological tools, machines, instrumentation, material, and processes. • Purposefully integrate core subject (math, science, history, English) matter in practical and technological life activities. • Students will develop leadership and interpersonal problem-solving skill through participation in co-curricular activities associated with KY-TSA.
Connections • Kentucky Technology Student Association (KY TSA) • Project Lead The Way • National Technological Literacy Content Standards • Kentucky Occupational Skill Standards (KOSSA)

Energy and The Environment
Valid Course Code
219914

Course Description: In this course students investigate the impact of energy on our lives and the environment. They design and model alternative energy sources and participates in an energy expo to demonstrate energy concepts and innovative ideas. Students evaluate ways to reduce energy consumption through energy efficiency and sustainability.
Content/Process

Students will

- Apply concepts found in the Standards for Technological Literacy.
- Compare and contrast technology and science.
- Investigate an engineering career and determine the requirements for entering the field.
- Explain how energy can be used to do work, using many processes.
- Utilize proper data collection skills and language arts skills in engineering notebook entries.
- Describe the ways that use of energy affects humans, including their safety, comfort, choices, and attitudes about technology development and use.
- Explain how energy is used in our environment.
- Define energy as the capacity to do work.
- Define power as the rate at which energy is converted from one from to another or transferred from one place to another, or the rate at which work is done.
- Identify the technologies that supply or control energy sources with considerations of trade-offs.
- List energy systems produced or used by industries.
- Explain power and energy applications in everyday life.
- Develop a safe and functional level of skill, efficiency, and effective use of technological tools, machines, instrumentation, material, and processes.
- Purposefully integrate core subject (math, science, history, English) matter in practical and technological life activities.
- Students will develop leadership and interpersonal problem-solving skill through participation in co-curricular activities associated with KY-TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- Project Lead The Way
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

#219915 – Green Architecture
Valid Course Code
219915

Course Description: Medical Detectives (MD) explores the biomedical sciences through hands-on projects and labs that require students to solve a variety of medical mysteries. Students investigate medical careers, vital signs, diagnosis and treatment of diseases, as well as human body systems such as the nervous system. Genetic testing for hereditary diseases and DNA crime scene analysis put the students in the place of real life medical detectives.
Content/Process

Students will

- Apply concepts found in the Standards for Technological Literacy.
- Compare and contrast technology and science.
- Investigate architectural careers and determine the requirements for entering the field.
- Utilize proper data collection skills and language arts skills in engineering notebook entries.
- Utilize the interactive (team) process for engineering design.
- Students will utilize basic principles of design through the use of freehand sketching.
- Recognize thumbnail sketches, isometric, orthographic, one- and two-point perspective drawings and accurately interpret what they see.
- Explore design techniques and develop basic skills with the use of CADD programs.
- Develop a safe and functional level of skill, efficiency, and effective use of technological tools, machines, instrumentation, material, and processes.
- Purposefully integrate core subject (math, science, history, English) matter in practical and technological life activities.
- Develop prototype models of green architectural structures.
- Explore green construction principles, fabrication, alternative materials, and architectural sustainability.
- Describe the importance of the concept of "being green" for next generation designers and builders.
- Develop a safe and functional level of skill, efficiency, and effective use of technological tools, machines, instrumentation, material, and processes.
- Purposefully integrate core subject (math, science, history, English) matter in practical and technological life activities.
- Students will develop leadership and interpersonal problem-solving skill through participation in co-curricular activities associated with KY-TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- Project Lead The Way
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Medical Detectives
Valid Course Code
219916

Course Description: Medical Detectives (MD) explores the biomedical sciences through hands-on projects and labs that require students to solve a variety of medical mysteries. Students investigate medical careers, vital signs, diagnosis and treatment of diseases, as well as human body systems such as the nervous system. Genetic testing for hereditary diseases and DNA crime scene analysis put the students in the place of real life medical detectives.

Content/Process

Students will

- Apply concepts found in the Standards for Technological Literacy.
- Compare and contrast technology and science.
- Investigate an engineering career and determine the requirements for entering the field.
- Utilize proper data collection skills and language arts skills in engineering notebook entries.
- Learn about human vital signs, pathogens and how they spread, the structure and function of the human brain, and how understanding the human body can help law enforcement to solve crimes.
- Students will apply utilize genetic testing in areas of crime scene analysis.
- Develop an understanding of genetic engineering with regards to hereditary diseases.
- Explore biomedical sciences to solve a variety of medical mysteries.
- Develop a safe and functional level of skill, efficiency, and effective use of technological tools, machines, instrumentation, material, and processes.
- Purposefully integrate core subject (math, science, history, English) matter in practical and technological life activities.
- Students will develop leadership and interpersonal problem-solving skill through participation in co-curricular activities associated with KY-TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- Project Lead The Way
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Foundations of Technology
Valid Course Code
210107

Course Description: This course provides the "foundation" for students to understand and apply technological concepts and processes that are the cornerstone for the high school technology program. Group and individual activities engage students in creating ideas, developing innovations, and engineering practical solutions. This course will focus on the three dimensions of technological literacy: 1) knowledge, 2) ways of thinking and acting, and 3) technological capabilities. The goal being that students develop the characteristics of a technologically literate citizen. The course will employ teaching/learning strategies that enable students to build their understanding of new ideas. It is designed to engage students in exploring and deepening their understanding of "big ideas" regarding technology.

This can be accomplished through modular or other instructional strategies. Instruction should be enriched through participation in Kentucky Technology Student Association challenges.

This course may be 18 or 36 weeks in duration

Content/Process

Students will
- Develop and demonstrate strategies and work habits that lead to success.
- Apply technological concepts (such as simple machines, circuits, sketching, fluid systems, etc.) to solve technical problems.
- Define and describe the nature of technology.
- Demonstrate an understanding of the dynamic nature of technology, analyze and interpret historical events, conditions, trends and issues to develop perspective on the impacts of technology on people, society, culture, and the environment.
- Demonstrate an awareness of current and emerging issues (e.g., ethical, social, legal, environmental, political, and privacy) related to technology.
- Explore technological concepts and processes in the contexts of Energy and Power, Information and Communication, Transportation, Manufacturing, Construction, Medical, Agriculture and Bio-Related Technologies.
- Identify opportunities, characteristics, and preparation requirements for occupations in current and emerging technology.
- Demonstrate an understanding of technological systems and the interrelationship between the resource/input, process, output, and feedback elements of these systems.
- Develop competencies in the safe, efficient, and effective use of tools, machines, materials, and processes.
- Communicate design solutions through formal and informal presentations.
- Demonstrate team, social, and employability skills relative to careers.
- Demonstrate team, social, and employability skills relative to careers.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections
- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Project Lead The Way
- Secretary's Commission on Achieving Necessary Skills (SCANS)
- Kentucky Occupational Skill Standards (KOSSA)

Course Description: This course contributes to the development of each high school student's capability to understand how technology's development, control, and use are based on design constraints and human wants and needs. The structure of the course challenges students to use technological design processes so that they can think, plan, design, and create solutions to engineering and technological problems. Students are actively involved in the organized and integrated application of technological resources, engineering concepts, and scientific procedures. Students address the complexities of technology that stem from designing, developing, using, and assessing technological systems.

The goals of this course can be accomplished through various laboratory instructional strategies utilizing the seven contexts of technological literacy. Instruction should be enriched through participation in Kentucky Technology Student Association challenges.

This course may be 18 or 36 weeks in duration.

Grade Level/s: 9 - 11	**Credit:** 1	**Prerequisite:** None

Content/Process

Students will
- Define design and describe the design process.
- Engage in meaningful, hands-on, minds-on, and conceptual technology-based activities using tools, machines, materials, and processes.
- Use the design process to fabricate products related to one or more of the seven contexts of technological literacy (agriculture, bio-related, medical, construction, manufacturing, transportation, and communications).
- Analyze various design concepts, constraints, and processes related to product development employing critical thinking skills.
- Work individually, in teams, or as a total class to solve design-related activities that incorporate Kentucky Core Content in the technological context.
- Identify opportunities, characteristics, and preparation requirements for current and emerging design related occupations.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections
- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Secretary's Commission on Achieving Necessary Skills (SCANS)
- Kentucky Occupational Skill Standards (KOSSA)

Technological Issues and Impacts
Valid Course Code
210109

Course Description: This course addresses the positive and negative impacts of technology and the intended and unintended results of its implementation. Students investigate and analyze critical historical and emerging issues affecting the creation, development, use and control of contemporary and future technology. Laboratory activities will allow students to propose and implement alternative solutions. Students will measure, quantify, assess, and communicate the impacts of these proposals and the issues that accompany them.

The goals of this course can be accomplished through various classroom and laboratory instructional strategies. Instruction should be enriched through participation in Kentucky Technology Student Association challenges.

This course may be 18 or 36 weeks in duration.

Content/Process

Students will

- Understand and utilize communications skills to plan for and accomplish objectives/goals.
- Identify how the characteristics of goal-directed research impact technology.
- Describe factors that motivate technological development (e.g. profit, function, form, quality, etc.).
- Identify and explore the impacts (intended and unintended) of technological advancements in Medical, Agriculture and related biotechnologies, Energy and Power, Information and Communication, Transportation, Manufacturing, and/or Construction Technologies.
- Analyze current and emerging issues (e.g., ethical, social, legal, environmental, political, and privacy) related to technology to identify appropriate and inappropriate applications of technology.
- Explain and apply a system of problem-solving.
- Use technological terminology correctly.
- Investigate and explain how business and planning components effect operations and societal impacts.
- Explore the ecological and economic impacts of unethical decisions (case studies and scenarios of regulation violations, whistle-blowing, kick-backs, pay-offs, labor disputes, illegal dumping, straight-pipe sewage, etc.).
- Identify the effects of continuous quality assurance.
- Utilize Core Concepts of Technology to identify social, political, and environmental impacts of technology.
- Design and fabricate evaluation tools (instruments, models, simulations, software) that assess the impact of products and systems through information collection and data synthesis.
- Design, construct, and assess alternative solutions to technological problems that minimize/alleviate negative impacts.
- Work individually, in teams, or as a total class to solve design-related activities that incorporate Kentucky Core Content in the technological context.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Secretary's Commission on Achieving Necessary Skills (SCANS)
- Kentucky Occupational Skill Standards (KOSSA)

Engineering Design
Valid Course Code
210110

Course Description: Engineering scope, content, and professional practices are presented through practical applications in this capstone course. Students in engineering teams apply technology and Kentucky Core Content and skills to solve engineering design problems and create innovative designs. Students research, develop, test, and analyze engineering designs using criteria such as design effectiveness, public safety, human factors and ethics.

Instruction should be enriched through participation in Kentucky Technology Student Association challenges.

This course may be 18 or 36 weeks in duration.

Content/Process

Students will

- Implement effective communication and teaming techniques for the accomplishment of objectives/goals.
- Evaluate designs based on function, criteria, and constraints. Identify, modify, and re-evaluate where design problems exist.
- Exhibit and exercise teaming, social, and employability skills relative to careers in engineering.
- Identify the effects of continuous quality assurance relative to human factors, safety, and ethics.
- Apply knowledge of the commonalities and interrelationships between design/functions of various technological systems.
- Apply the design process to technological problem-solving.
- Engage in meaningful, hands-on, minds-on, and conceptual technology-based activities using tools, machines, materials, and processes.
- Apply concepts from Kentucky Core Concepts in the context of technology education.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Secretary's Commission on Achieving Necessary Skills (SCANS)
- Kentucky Occupational Skill Standards (KOSSA)

Special Problems in Technology
Valid Course Code
210111

Course Description: This independent-study course is designed to allow a High School student to study in-depth a technology topic or issue. The experience will enable the student to gain a more comprehensive knowledge of a particular technological context. A variety of instructional strategies using multiple resources, specialized laboratories, and collaboration with mentoring experts should be encouraged. Independent studies and/or internships could be utilized. Instruction should be enhanced through participation in Kentucky Technology Student Association challenges.

Content/Process

Students will

- Apply communication skills through presentations, reports, and demonstration.
- Apply a systems approach, research skills, (e.g., creative problem solving, critical thinking, teamwork, leadership, acceptance of personal responsibility), and a variety of resources including information, tools and materials to the resolution of a work-based or community-based problem.
- Demonstrate a thorough understanding of technological contexts and their interrelationships and impacts.
- Use contemporary technologies to communicate, process, manipulate, collect, and apply information to solve technical problems.
- Integrate and apply concepts from the Kentucky Core Content in the context of contemporary technology.
- Demonstrate proficiency in the safe, efficient, and effective use of tools, machines, materials, and processes.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Secretary's Commission on Achieving Necessary Skills (SCANS)
- Kentucky Occupational Skill Standards (KOSSA)

Special Technological Topics
Valid Course Code
210112

Course Description: Special Technology Topics allows the teacher to develop a course for in-depth exploration of technological topics. This is a laboratory-based course designed to study a technological system or topic, and/or a recent technological advancement. This study should include how this advancement affects society and/or the environment. A culminating project integrating one or more of the seven contexts of technological literacy and the Kentucky Core Content is encouraged. It should include research, design, construction, analysis, writing, and presenting. Instruction should be enriched through participation in Kentucky Technology Student Association. This course may be 18 to 36 weeks in duration.

Content/Process

Students will
- Apply communication skills through presentations, reports, and demonstration.
- Apply concepts found in the Standards for Technological Literacy.
- Apply concepts from the Kentucky Core Content in the context of Technology Education.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.
- Utilize the interactive (team) process for engineering design.
- Use instruments to collect and analyze data.
- Identify current and emerging careers related to technology.
- Develop proficiencies in the safe, efficient, and effective use of tools, machines, materials, and processes.
- Communicate the culminating experience/project through reflection, documentation, and various presentation techniques.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections
- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Secretary's Commission on Achieving Necessary Skills (SCANS)
- Kentucky Occupational Skill Standards (KOSSA)

Advanced Design Applications
Valid Course Code
210117

Course Description: This course consists of the first four units of the ProBase curriculum. These units are: Manufacturing, Energy and Power, Construction and Transportation.   The Manufacturing unit examines the advance that maintain manufacturing efficiency, how human consumption affects manufacturing, how manufacturing affects the standard of living of various peoples, and how processing and changing raw materials can produce more desirable products. The Construction unit examines a number of the factors influencing the design and construction of permanent and semi-permanent structures. The practice related to construction maintenance, alterations, and renovation, and the functions of the primary systems installed in those structures. The Energy and Power unit explores the relationship between energy and power technologies and all other technologies and how modern energy and power system impact cultures, societies and the environment. It also offers an examination of how energy and power systems can be made more efficient and how they may be utilized in problem solving. The Transportation unit examines the complex networks of interconnected subsystems that each transportation system comprises and the roles of these components in the overall functional process of the system. It also analyzes the improvements and the impacts of transportation technologies on the environment, society, and culture.   Each of the four units is approximately 9 weeks in length. If the course is scheduled for 18 weeks, only 2 units can be completed. Completion of all four units requires a 36-week course.

Content/Process

Students will
- Identify advances that maintain manufacturing efficiency.
- Describe how human consumption affects manufacturing.
- Relate how manufacturing affects the standard of living of various peoples.
- Identify processes for changing raw materials into more desirable products.
- Explore the relationships between energy and power technologies and all other technologies.
- Define how modern energy and power systems impact cultures, societies, and the environment.
- Describe how energy and power systems can be made more efficient.
- Identify how power systems may be utilized in problem solving.
- Identify factors influencing the design and construction of permanent and semi-permanent structures.
- Demonstrate practices related to construction maintenance.
- Apply alteration and renovation techniques.
- Describe the complex networks of interconnected subsystems of each transportation system.
- Identify the components that comprise and the roles of these components in the overall functional process of the system.
- Analyze improvements and impacts of transportation technologies on the environment, society, and culture.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Advanced Technological Applications
Valid Course Code
210118

Course Description: This course consists of the remaining four units of the ProBase curriculum. These units are: Information Technology, Agriculture and Bo-related Technologies, Medical, and Entertainment/Recreation Technology. The Information Technologies unit examines how technology facilitates the gathering, manipulation, storage, and transmission of data, and how this data can be used to created useful products. It also provides students with opportunities for developing communication systems that can solve technological problems. The Agriculture and Bio-related Technologies unit explores how agricultural technologies provide increased crop yields and allow adaptation to changing and harsh environments, enabling the growth of plants and animals for various uses. It also offers an analysis of the various uses of biotechnology and the ethical considerations of those uses. The Medical Technologies unit provides an analysis of how medical technologies are used to increase the quality and length of human life, and require public debate. Students will also examine tools and devices used to repair and replace organs, prevent disease, and rehabilitate the human body. The Entertainment/Recreation unit provides a study of technological entertainment and recreation systems, with an examination of the differences between these technologies, of how their use enhances human leisure-time performance and of the social, cultural, and environmental implications of their usage. Each of the four units is approximately 9 weeks in length. If the course is scheduled for 18 weeks, only 2 units can be completed. Completion of all four units requires a 36-week course.

Content/Process

Students will

- Identify how technology facilitates the gathering, manipulation, storage & transmission of data.
- Use data to create useful products.
- Design and construct communications systems that can solve technological problems.
- Define how agricultural technologies provide increased crop yields.
- Identify adaptations to changing and harsh environments.
- Identify technologies that enhance the growth of plants and animals for various uses.
- Analyze the various uses of biotechnology.
- Apply ethical considerations of biotechnology.
- Analyze how medical technologies are used to increase the quality and length of human life.
- Define how increased use of technology carries potential consequences which require public debate.
- Identify and examine tools and devices used to repair and replace organs, prevent disease, and rehabilitate the human body.
- Identify technological entertainment and recreation systems.
- Define the social, cultural, and environmental implications of entertainment/recreation technology usage.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Secretary's Commission on Achieving Necessary Skills (SCANS)
- Kentucky Occupational Skill Standards (KOSSA)

Graphic Communications
Valid Course Code
210133

Course Description: This is a fundamental course that offers a cross- disciplinary program designed for students interested in gaining knowledge and skills in various phases of graphic communication technology. This is a project based program with activities in, but not limited to, computer design, digital imaging, document layout, multimedia, web site development, digital printing, offset printing, screen and sublimation printing processes, bindery, packaging technology. Students apply creative problem solving while learning about technology and management practices related to the production and distribution of graphic media in its many forms. Instruction should be enhanced through participation in Kentucky Technology Student Association challenges. This course may be 18 to 36 weeks in duration

Content/Process

Students will
- Apply communication skills through presentations, reports, and demonstration.
- Apply concepts found in the Standards for Technological Literacy.
- Apply concepts from the Kentucky Core Content in the context of Technology Education.
- Understand the evolution and purpose of graphic design.
- Explore various methods of printing, audio and video, digital imaging, and computer aided design for the production of graphic communication projects.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.
- Demonstrate an understanding of and be able to select and use information and communication technologies.
- Identify current and emerging careers related to technology.
- Develop proficiencies in the safe, efficient, and effective use of tools, machines, materials, and processes.
- Perform layout, design, and measurement activities associated with desktop publishing.
- Demonstrate technical knowledge and skills in the area of product design and design process.
- Demonstrate proficiency with common computer peripherals, including connections to standard input and output devices.
- Develop an awareness of emerging technologies associated with communication design.
- Communicate the culminating experience/project through reflection, documentation, and various presentation techniques.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections
- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Material & Process Technology
Valid Course Code
210134

Course Description: The purpose of this program is to provide students with a foundation of knowledge and technically oriented experiences in the study of the technology of materials and processes. This program focuses on transferable skills and stresses understanding and demonstration of the technological tools, machines, instruments, materials, processes and systems in business and industry. The content includes, but not limited to, a study of the pre-processing, processing and post processing of wood, metal, plastics, composites, and other materials. The content and activities will also include the study of entrepreneurship, safety, and leadership skills through the participation in Kentucky Technology Student Association. This course may be 18 to 36 weeks in duration.

Content/Process

Students will

- Apply concepts found in the Standards for Technological Literacy.
- Apply concepts from the Kentucky Core Content in the context of Technology Education.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.
- Utilize the interactive (team) process for engineering design.
- Use instruments to collect and analyze data.
- Identify current and emerging careers related to technology.
- Demonstrate safe and appropriate use of tools, machines, and materials in materials & processes technology
- Identify statics and strength of materials.
- Identify material classifications and properties utilizing appropriate testing methods.
- Use appropriate engineering methodology for maximizing product reliability.
- Demonstrate technical knowledge and skills associated with processing activities and practices of industrial materials.
- Evaluate various types of wood, wood composites and industry related materials.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections

- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

#210135 – Production Technology
Valid Course Code
210135

Course Description: This course is to allow students the opportunity to develop a project from "vision to reality by working with teams to design, engineer, manufacture, construct, test, redesign, and produce a finished project. This course can serve as capstone course working with business and industry as part of their design, development, fabrication, and marketing using skills and knowledge from previous manufacturing courses.

Content/Process

Students will
- Apply concepts found in the Standards for Technological Literacy.
- Apply concepts from the Kentucky Core Content in the context of Technology Education.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.
- Utilize the interactive (team) process for engineering design.
- Employ the manufacturing process including the designing, development, fabrication, troubleshooting and testing, problem solving and marketing various products.
- Research and identify consumer demands for a manufacture product.
- Prepare a plan for marketing and distributing a manufactured product.
- Identify current and emerging careers related to technology.
- Demonstrate safe and appropriate use of tools, machines, and materials in materials & processes technology.
- Identify statics and strength of materials.
- Identify material classifications and properties utilizing appropriate testing methods.
- Use appropriate engineering methodology for maximizing product reliability.
- Demonstrate technical knowledge and skills associated with processing activities and practices of industrial materials.
- Evaluate various types of wood, wood composites and industry related materials.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections
- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Introduction to Advanced Manufacturing
Valid Course Code
210136

Course Description: A project based course that introduces students to manufacturing's role in our society. In addition to concentrating on design and problem solving the course introduces students to several other concepts as well including an introduction to control system technology, automated manufacturing systems and robotics. This is a project based program of study that includes reverse engineering activities, manufacturing basics, manufacturing roles, DC motors and electricity, thermoforming and temperature control, tank volume control, and production monitoring systems.

Content/Process

Students will
- Apply concepts found in the Standards for Technological Literacy.
- Students will be able to identify the basic processes, systems, designs, and materials used in manufacturing.
- Conduct reverse engineering processes to describe the processes and materials used to manufacture a given product (i.e., a pencil, an adjustable wrench, a milk carton, a clipboard, etc.).
- Analyze product features to identify manufacturing processes that may have been used (i.e., differentiate between products that utilize hardened steel and low carbon steel - a hinge and a nail, etc).
- Describe how different manufacturing processes can be used to produce similar products (i.e., a stamped wrench vs. a forged wrench).
- Identify product families.
- Apply the design and problem solving process as an iterative process incorporating sciences, mathematics and engineering to optimally convert resources to meet a stated objective.
- Conduct model documentation as the process of recording details such as size, material composition, and instructions for assembling, installation and servicing, analysis, development process that describes a model for the purpose of communication of ideas.
- Apply the principles of design for manufacturing enabling the efficient and effective production of products
- Communicate solutions utilizing technical writing skills including correct spelling, proper grammar and dependent vocabulary.
- Utilize the interactive (team) process for engineering design.
- Demonstrate safe and appropriate use of tools, machines, and materials in materials & processes technology
- Select and defend a material for use in a product, explaining material properties and characterization, based upon manufacturing processes, chemical composition, internal defects, temperature, previous loading, dimensions and other factors.
- Develop personal and professional leadership skills through participation in KY TSA.
- Investigate activities that a business conducts with the intention of making a discovery that can either lead to the development of new products or procedures, or to improvement of existing products or procedures and to know the new approaches of rapid development and deployment that saves time and is more efficient.
- Construct and critique a plan for an assembly line or work cell.

Connections
- Kentucky Technology Student Association (KY TSA)
- Southern Regional Education Board (SREB)
- Kentucky Occupational Skill Standards (KOSSA)

Systems of Advanced Manufacturing
Valid Course Code
210137

Course Description: This course applies the learning from Intro to Advanced Manufacturing. This course involves projects related to the systems that are found in factories. Students learn about effective and energy efficient use of motors, drive systems, pumping systems, conveyors, piping and control systems. Students focus on properties of materials and materials testing creating documentation examining the properties and justifying selections based on the properties. Students learn that some products manufactured become the raw materials for more complex products. Students will explore projects such as automated tank control, design automated inspection systems, and design software controlled mechatronic systems, material separation, and lean manufacturing.
Prerequisite: 210136 Intro to Advanced Manufacturing

Content/Process

Students will

- Apply concepts found in the Standards for Technological Literacy.
- Students will be able to identify the basic processes, systems, designs, and materials used in manufacturing.
- Develop the ability to collect data, transform into information, and use that information to improve an existing process is an enabling skill for advanced manufacturing
- Will be able to apply automated control systems to existing manual processes can dramatically improve quality and reduce the amount of human (manual) time required.
- Apply the design and problem solving process as an iterative process incorporating sciences, mathematics and engineering to optimally convert resources to meet a stated objective.
- Design and analyze an electrical system to convert, transform and transmit electricity to where it is needed with the goal of reducing energy consumption.
- Design the control system to vary the speed and performance of a motor by utilizing feedback from the system to gain the most efficiency possible.
- Formulate a system to utilize data collection and analysis to maintain and improve product quality and provide adequate confidence that the product will satisfy design requirements.
- Design and analyze the application of system of machines with control systems, sensory feedback, and information processing to reduce the need for human work in the production of goods and services.
- Explore the use of electronic sensors, detect and transform real world phenomena into information that can be used by computers to control valves, pumps, and other industrial equipment.
- Apply mathematical models of physical phenomena, such as heat transfer in liquids, can be used to design an automated system that will outperform any manual system.
- Design and analyze the application of system of machines with control systems, sensory feedback, and information processing to reduce the need for human work in the production of goods and services.
- Conduct model documentation as the process of recording details such as size, material composition, and instructions for assembling, installation and servicing, analysis, development process that describes a model for the purpose of communication of ideas.
- Communicate solutions utilizing technical writing skills including correct spelling, proper grammar and dependent vocabulary.
- Utilize the interactive (team) process for engineering design.
- Demonstrate safe and appropriate use of tools, machines, and materials in materials & processes technology.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- Southern Regional Education Board (SREB)
- Kentucky Occupational Skill Standards (KOSSA)

Mechanical and Technical Design
Valid Course Code
210138

Course Description: This is considered a basic course that will provide students with instructions in the characteristics and evolution of drafting technology, underlying principles of design and fundamental knowledge and skills in the use mechanical drawing, illustrations, and various forms of mechanical drawings, geometry and applied mathematics that apply to architectural and/or engineering design. Introduction to various forms of computer aided software to gain basic skills and knowledge.

Content/Process

Students will

- Apply concepts found in the Standards for Technological Literacy.
- Apply concepts from the Kentucky Core Content in the context of Technology Education.
- Define used on technical drawings.
- Identify current and emerging careers related to technology.
- Use basic drafting tools and techniques and develop accurate measurement techniques to communicate drafting ideas.
- Demonstrate various drawing scales used in technical drawing.
- Through the use of basic drafting equipment students will produce geometric shapes and figures that describe various objects, structures, and designs.
- Demonstrate knowledge and skill with illustration technique and working drawings.
- Construct charts/tables/graphs using functions and data.
- Solve problems using critical thinking skills, creativity and innovation.
- Demonstrate basic mathematic concepts in basic arithmetic, algebra, geometry, and trigonometric to solve problems and apply multiple discipline calculations.
- Prepare mechanical drawings that consist of, but not limited to, isometric, oblique, 3-view orthographic projections, auxiliary views, sectional and dimensions.
- Apply the design process involving problem identification, conceptualization, research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.

- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections

- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Fundamentals of Engineering Design I
Valid Course Code
210221

Course Description: Introduction to Computer Aided Drafting and Engineering Design Principles. This course continues to apply the skills, concepts, and principles of engineering. Students explore various technological systems and engineering processes in related career fields. Topics include investigating technological system, design optimization, and problem solving. Students utilize CAD and physical and virtual modeling concepts to construct, test, collect, and report data. Instruction should be enhanced through participation in Kentucky Technology Student Association challenges.
This course may be 18 to 36 weeks in duration

Content/Process

Students will

- Recognize how the History of Design (including artistic periods, styles, and form and function) influences product development.
- Perform basic computer aided drafting functions and develop knowledge and skills in the use of various software programs.
- Research information about professional engineering-related organizations.
- Apply the design process involving problem identification, conceptualization, research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.

- Use principles and elements of design including portfolio development containing various written work, drawings, models, and other documentation.
- Perform sketching and visualization using proper techniques and tools to produce pictorial, annotated sketches, multi-view or orthographic drawings using proper and accurate measurements.
- Apply geometric relationships of forms and shapes, lines, various polygons, geometric constraints, Cartesian coordinate system, and origin planes.
- Perform modeling using conceptual, graphical, physical, mathematical, and computer generated techniques, including 3-dimensional software.
- Conduct model analysis and verification.
- Create model documentation including working drawings, dimensioning, and annotations.
- Develop product presentations using proper communication techniques and appropriate presentation aids.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections
- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Engineering Design II
Valid Course Code
210222

Course Description: A project and research based Computer Aided Drafting and Design course that extends the learning experiences where students focus on mechanical, electrical, fluid and thermal systems allowing in depth exploration in selected disciplines of engineering areas such as manufacturing, power/energy/transportation, bio-medical, robotics, hydraulics, electricity/electronics, communications, construction systems, alternative energy and computer aided design and problem solving. Instruction should be enhanced through participation in Kentucky Technology Student Association challenges. This course may be 18 to 36 weeks in duration.

Content/Process

Students will

- Recognize how the History of Design (including artistic periods, styles, and form and function) influences product development.
- Research information about professional engineering-related organizations.
- Develop and demonstrate competencies with pictorial drawings, threads and fasteners, gears and cams, and pipe drafting.
- Apply the design process involving problem identification, conceptualization, research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.

- Apply geometric relationships of forms and shapes, lines, various polygons, geometric constraints, Cartesian coordinate system, and origin planes.
- Perform modeling using conceptual, graphical, physical, mathematical, and computer generated techniques, including 3-dimensional software.
- Develop knowledge and understanding of basic electric, welding and industrial process and symbols.
- Develop knowledge and understanding of concepts of CAD architecture, construction techniques, structural systems, hydraulics and pneumatics systems.
- Conduct model analysis and verification.
- Create model documentation including working drawings, dimensioning, and annotations.
- Develop product presentations using proper communication techniques and appropriate presentation aids.
- Perform modeling using conceptual graphical, physical, mathematical, and computer generated techniques, including 3-dimensional software.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections

- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Fundamentals of Architectural and Civil Engineering
Valid Course Code
210223

Course Description: This is an introduction to residential and light commercial building construction and design. Students will learn basic sketching, mechanical drafting skills with an emphasis on computer aided drafting. In this class, students will design a structure relevant to today's modern architecture and create models of their designs with various materials and tools. Students will experience and solve many problems in designing or building structures with regards to environment and community impact and limitations from town planning, urban design and landscape architecture to furniture and objects. Instruction should be enhanced through participation in Kentucky Technology Student Association challenges.   This course may be 18 to 36 weeks in duration

Content/Process

Students will

- Recognize how the History of Design (including artistic periods, styles, and form and function) influences product development.
- Perform basic computer aided drafting functions and develop knowledge and skills in the use of various software programs.
- Define civil engineering and architecture.
- Explain project design and project documentation.
- Create project planning documentation including site information and development options.
- Conduct site planning including grading, public ingress/egress, utilities, landscaping, water supply, and wastewater management.
- Develop architecture plans reflecting various architectural styles that include floor plans, elevations, sections and details, schedules, HVAC, plumbing, and electrical systems, as well as communication and protection systems.
- Define and evaluate structural engineering components including foundations, columns, beams, and roof systems.
- Develop presentations of potential construction projects.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.
- Use principles and elements of design including portfolio development containing various written work, drawings, models, and other documentation.
- Perform sketching and visualization using proper techniques and tools to produce pictorial, annotated sketches, multi-view or orthographic drawings using proper and accurate measurements.
- Apply geometric relationships of forms and shapes, lines, various polygons, geometric constraints, Cartesian coordinate system, and origin planes.
- Perform modeling using conceptual, graphical, physical, mathematical, and computer generated techniques, including 3-dimensional software.
- Conduct model analysis and verification.
- Create model documentation including working drawings, dimensioning, and annotations.
- Develop product presentations using proper communication techniques and appropriate presentation aids.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections

- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Principles of Engineering
Valid Course Code
210224

Course Description: This is a fundamental course that provides a project based learning approach to understanding the principles and concepts of physics and associated mathematics for most Engineering Technology programs. Students explore various careers and disciplines of engineering areas, problem solving and core technology such as, but not limited to; manufacturing, power/energy/transportation, robotics, hydraulics, electricity/electronics, communications, construction systems, alternative energy and computer aided design. Instruction should be enhanced through participation in Kentucky Technology Student Association challenges.   This course may be 18 to 36 weeks in duration.

Content/Process

Students will
- Define the various types of engineering.
- Apply communication and documentation including sketching, technical writing, data representation and presentation.
- Use the design process for product development involving problem identification, problem analysis, information gathering, alternative solutions and optimization, modeling, testing and evaluation, and presentation of solution.
- Define engineering systems including mechanisms, thermodynamics, fluid systems, electrical systems and control systems.
- Identify statics and strength of materials.
- Identify material classifications and properties utilizing appropriate testing methods.
- Consider the ethical, environmental, social, and economic impact of the engineering design process is essential to being a responsible, involved citizen.
- Calculate work and power in mechanical systems.
- Measure forces and distances related to simple machines and mechanisms.
- Calculate mechanical advantage and drive ratios of mechanisms.
- Design, create, analysis and produce a mechanical system.
- Use appropriate engineering methodology for maximizing product reliability.
- Define dynamics/kinematics including linear and trajectory motion.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections
- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Introduction to Manufacturing and Manufacturing Systems
Valid Course Code
210225

Course Description: This is a comprehensive course designed for the study of general concepts and principles of Manufacturing and Manufacturing systems. This course provides for hands-on learning experience which enhances the understanding of various metallic/nonmetallic materials, processes, and products. Materials studied may include polymers, ceramics, woods, composites, and metal materials associated with manufacturing   Students will use basic tools, equipment and operations of manufacturing industries. Students have the opportunity to engage in product design, prototyping, computer-assisted manufacturing applications, CNC machines, robotics, and production management. Instruction should be enhanced through participation in Kentucky Technology Student Association challenges.

Content/Process

Students will

- Apply concepts found in the Standards for Technological Literacy.
- Students will be able to identify the basic processes, systems, designs, and materials used in manufacturing.
- Identify product families.
- Apply the design and problem solving process as an iterative process incorporating sciences, mathematics and engineering to optimally convert resources to meet a stated objective.
- Conduct model documentation as the process of recording details such as size, material composition, and instructions for assembling, installation and servicing, analysis, development process that describes a model for the purpose of communication of ideas.
- Apply the principles of design for manufacturing enabling the efficient and effective production of products
- Distinguish the difference between custom and industrial furniture production
- Utilize the interactive (team) process for engineering design.
- Demonstrate safe and appropriate use of tools, machines, and materials in materials & processes technology
- Select and defend a material for use in a product, explaining material properties and characterization, based upon manufacturing processes, chemical composition, internal defects, temperature, previous loading, dimensions and other factors.
- Demonstrate an understanding of mechanisms and how they relate to manufacturing systems.
- Apply the principals of robotics to automated systems.
- Integrate control systems and equipment with production and production support mechanisms.
- Demonstrate proficiency in the set-up and operation of manual and CNC wood and/or metalworking machines.
- Demonstrate proficiency in computer-aided drafting/computer aided manufacturing (CAD/CAM) software.
- Develop personal and professional leadership skills through participation in KY TSA.
- Investigate activities that a business conducts with the intention of making a discovery that can either lead to the development of new products or procedures, or to improvement of existing products or procedures and to know the new approaches of rapid development and deployment that saves time and is more efficient.

Connections
- Kentucky Technology Student Association (KY TSA)   - National Technological Literacy Content Standards   - Kentucky Occupational Skill Standards (KOSSA)

Introduction to Aerospace
Valid Course Code
210226

Course Description: The course covers the exploration of aerospace including, flight/aeronautics, aircraft maintenance, aeronautical engineering, and space. Students will learn about the forces that affect controlled flight, investigate properties of lift, and explore flight through a flight simulator. Students will also learn about aerospace standard materials, aviation safety, aircraft and wing design, and elements of a space mission resource system.

Content/Process

Students will

- Demonstrate an understanding of the history and development of aviation and space transportation.
- Describe the aviation/aerospace environment.
- Describe and demonstrate an understanding of the forces that affect flight.
- Describe and demonstrate an understanding of lift through Bernoulli's Principle and Newton's Third Law of Motion.
- Describe and demonstrate an understanding of the principles of flight.
- Describe and demonstrate how flight simulators are used for training.
- Demonstration flight maneuvers in a simulator: straight and level, turns, and climbs and descents.
- Demonstrate technical knowledge of computer control as it is related to aviation/aerospace projects.
- Describe and demonstrate an understanding of the materials that are used in aircraft design/development.
- Describe and demonstrate an understanding of airfoils and their use in aviation.
- Describe and demonstrate an understanding of rocketry/satellite technology and its application in space environments.
- Describe and demonstrate an understanding of the process for deploying space assets through mission operation models.
- Explore the role of civilian spacecraft in the exploration and colonization of space.
- Demonstrate an understanding of career opportunities and requirements in the field of aerospace technologies.
- Demonstrate language arts knowledge and skills.
- Demonstrate mathematics knowledge and skills.
- Demonstrate science knowledge and skills.
- Use oral and written communication skills in creating, expressing and interpreting information and ideas.
- Solve problems using critical thinking skills, creativity and innovation.

Connections

- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)
- Federal Aviation Administration (FAA)

Fundamentals of Aerospace Engineering
Valid Course Code
210229

Course Description: The fundamental concepts, and approaches of aerospace engineering, are highlighted through lectures on aeronautics, astronautics, and design. Active learning aerospace modules make use of information technology. Project based program where students will design, build and test projects such as lighter-than-air (LTA) vehicle or various wing designs. The connections between theory and practice are realized in the design exercises. Required design reviews precede the LTA race competition. The performance, weight, and principal characteristics of the LTA vehicles or wing designs are estimated and illustrated using physics, mathematics, and chemistry. Emphasis being on the application of this knowledge to aerospace engineering and design through the use of computer aided software.

Content/Process

Students will
- Identify the various vehicles used for human flight.
- Identify and explain the forces acting on an airplane, how the main components of the airplane control these forces, and how changes to the design of the airplane affect performance.
- Apply the design process involving problem identification, conceptualization, research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.

- Use principles and elements of design including portfolio development containing various written work, drawings, models, and other documentation.
- Perform sketching and visualization using proper techniques and tools to produce pictorial, annotated sketches, multi-view or orthographic drawings using proper and accurate measurements.
- Apply geometric relationships of forms and shapes, lines, various polygons, geometric constraints, Cartesian coordinate system, and origin planes.
- Perform modeling using conceptual, graphical, physical, mathematical, and computer generated techniques, including 3-dimensional software.
- Conduct model analysis and verification.
- Create model documentation including working drawings, dimensioning, and annotations.
- Use modeling and spreadsheet software to design and analyze data from various airfoil shapes.
- Identify the various instruments used to measure the lift and drag forces generated by an airfoil in a wind tunnel.
- Communicate test results through a technical report and a presentation to the class.
- Develop knowledge about the evolving technology of aerial navigation including VFR, IFR, VOR, Wide Area Augmentation System (WAAS), Local Area Augmentation Systems (L.A.A.S.), and Synthetic Vision systems to the Global Positioning System.
- Define terms and concepts of the design, flight, and forces on a rocket and be able to explain how they interact.

- Use trigonometry to calculate performance of rockets.
- Explain basic orbit theory satellite motion and orbit parameters.
- Work cooperatively in a team to design and conduct experiments related to positive G-force.
- Analyze various materials to determine their appropriate application in space craft.
- Design a computer-driven system for a robot to perform a series of predetermined functions without having anything impede its progress while successfully delivering a payload to a predetermined location.
- Design, build, and test an intelligent vehicle that will meet criteria determined by students.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections
- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)
- Massachusetts Institute of Technology (MIT)

Fundamentals of Mechatronics
Valid Course Code
210230

Course Description: Electro-Mechanical Systems courses provide students with instruction and experience with mechanical devices, actuators, sensors, electronics, intelligent controllers and computers. Students gain an understanding of the principles of electricity and mechanics and their application to gears, including hydraulic/pneumatic equipment, cams, levers, circuits, and other devices used in the manufacturing process or within manufactured goods. Instruction should be enhanced through participation in Kentucky Technology Student Association challenges. This course may be 18 to 36 weeks in duration

Content/Process

Students will

- Use the design process for product development involving problem identification, problem analysis, information gathering, alternative solutions and optimization, modeling, testing and evaluation, and presentation of solution.
- Define engineering systems including mechanisms, thermodynamics, fluid systems, electrical systems and control systems.
- Demonstrate a fundamental understanding of electronics and electricity
- Apply troubleshooting and critical thinking skills to define the problem
- Identify material classifications and properties utilizing appropriate testing methods.
- Calculate work and power in mechanical systems.
- Measure forces and distances related to simple machines and mechanisms.
- Calculate mechanical advantage and drive ratios of mechanisms.
- Design, create, analysis and produce a mechanical system.
- Demonstrate proficiency in using tools, instruments and testing devices.
- Demonstrate a fundamental understanding of AC/DC electrical and electrical control.
- Demonstrate an understanding of industrial safety, health, and environmental requirements.
- Apply the principals of robotics to industrial automation systems.
- Demonstrate proficiency in computer control and robotics.
- Operate, troubleshoot, pneumatic, hydraulic and electromechanical components and/or systems.
- Use machine interfaces to control automated systems.
- Define dynamics/kinematics including linear and trajectory motion.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections
- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Introduction to Mining Engineering & Technology
Valid Course Code
210231

Course Description: This course introduces students to the careers and basic engineering principles of various forms of mining and systems. Students will learn understand the challenges of future technologies as it relates to safety and environmental impact. Student will be able to apply engineering designing process as part of modern strategic mine planning. Students will be able to identify the importance for mine regulations, safety, proper management, required training, certifications and health risks. Instruction should be enhanced through participation in Kentucky Technology Student Association challenges. This course may be 18 to 36 weeks in duration

Content/Process

Students will

- Use the design process for product development involving problem identification, problem analysis, information gathering, alternative solutions and optimization, modeling, testing and evaluation, and presentation of solution.
- Define coal engineering processes.
- Explore the importance of mining in state wide and globally.
- Demonstrate knowledge of mechanical systems, thermodynamics, fluid systems, electrical systems and control systems.
- Explore opportunities with career awareness, exploration and planning of coal mining and related careers.
- Identify material classifications and properties utilizing appropriate testing methods.
- Demonstrate proficiency in using tools, instruments and testing devices.
- Demonstrate a fundamental understanding of AC/DC electrical and electrical control.
- Demonstrate an understanding of industrial safety, health, and environmental requirements.
- Explore the surface and underground mining methods and operations.
- Examine the health and safety considerations in the mining industry.
- Develop an understanding on the environmental impact and challenges with mining technology.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections

- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)
- Kentucky Community and Technical College System (KCTCS)
- Kentucky Coal Academy

Electricity and Electronics Fundamentals
Valid Course Code
210232

Course Description:
Course Description: In this course students will gain skills and knowledge through classroom and lab activities in the areas of basic DC and AC circuits, circuit components, codes, testing, electromagnetism and inductance, capacitance, power supplies, power generation and distribution, amplification, digital circuits, and computer fundamentals. Students will learn the safe use of the tools, test instruments, equipment and supplies used in this course plus information on career opportunities in this field. Hands-on and problem solving activities will expose students to areas of electron theory, Ohm's Law, insulators, conductors, electronic components, oscillators, radio transmission and reception, telephone communications, audio system, television transmission and reception, microcomputers, and electronic fabrication. Instruction should be enhanced through participation in Kentucky Technology Student Association challenges.   This course may be 18 to 36 weeks in duration

Content/Process

Students will

- Develop competences and skills in the area of electrical drafting.
- Demonstrate knowledge and skill with home automation technology.
- Develop knowledge and understanding of programmable logic controllers and electrical motors.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.
- Demonstrate safe and appropriate use of tools, machines, and materials in electrical and electronic technology.
- Understand an apply knowledge of direct current circuits and alternating current circuits as related to electrical technology.
- Describe, construct, conduct, and analyze experiments with basic DC and AC circuits and with circuits using magnetism.
- Describe the structure of matter related to electricity and electronics.
- Use Ohm's law and Watt's law to analyze and experiment with resistive circuits.
- Describe, construct, analyze and experiment with capacitive circuits.
- Demonstrate the use of electrical and electronic equipment.
- Demonstrate proper electronic assembly methods.
- Demonstrate an understanding of basic electrical circuits and electronic systems.
- Describe and experiment with integrated circuits.
- Describe, construct, and experiment with circuits using semiconductors.
- Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
- Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
- Describe the importance of professional ethics and legal responsibilities.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Fundamentals of Aviation Science I
Valid Course Code
210233

Course Description: The course covers the history of fundamentals of aerospace including, the development of the balloon (lighter than air vehicles, gliders, rockets, and heavier than air flight vehicles. Introduces students to the basic science of aerodynamics: including the development of aircraft from the Wright Brothers to the present day while exposing students to the various career opportunities in aerospace.

Content/Process

Students will

- Demonstrate an understanding of the history and development of aviation and space transportation.
- Recognize the important milestones prior to the first successful flight
- Describe and demonstrate an understanding of the principles of flight.
- Describe different wing platforms and how they alter flight performance and characteristics.
- Identify why the Wright Brothers were able to achieve the first successful manned, powered, sustained airplane flight.
- Demonstrate an understanding of power systems including, internal combustion engines, jet engines, rocket engines, solar cells and nuclear power used in aviation/aerospace applications.
- Describe the aviation/aerospace environment.
- Demonstrate an understanding of electrical, mechanical, fluid, and pneumatic systems that could be used on/in aviation/aerospace environments.
- Demonstrate a knowledge and understanding of processing skills on materials and composites as they relate to aerospace technologies.
- Describe and demonstrate principles of navigation.
- Explore the role of civilian spacecraft in the exploration and colonization of space.
- Describe various factors critical to aircraft performance.
- Demonstrate an understanding of the effects of flight as it relates to physiology.
- Perform advanced study and technical skills related to aerospace technologies.
- Demonstrate an understanding of career opportunities and requirements in the field of aerospace technologies.
-         Demonstrate science and mathematics knowledge and skills.
- Use oral and written communication skills in creating, expressing and interpreting information and ideas.
- Solve problems using critical thinking skills, creativity and innovation. Develop personal and professional leadership skills through participation in KY TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)
- Federal Aviation Administration (FAA)
- National Science Teachers Association's (NSTA)

Aviation Science II
Valid Course Code
210234

Course Description: This course prepares students for flight training and aircraft operations. Students will gain knowledge and skills in airport systems, air traffic control procedures, aviation weather, air navigation, radio communication procedures, and Federal Aviation Regulations (FAR's). Learning activities may include, but not limited, to operation of flight simulators and/or aircraft that will prepare them for the FAA Private Pilot Written Examination. This course covers the history of aviation law, federal regulation of air transportation and the role of state and federal government in aviation law, including functions of the Federal Aviation Administration. Students will become familiar with aircraft power plants, principles of flight, aircraft systems/instruments, and science of weather.

Content/Process

Students will
- Demonstrate an understanding of the history and development of aviation and space transportation.
- Recognize the important milestones prior to the first successful flight
- Describe and demonstrate an understanding of the principles of flight.
- Describe different wing platforms and how they alter flight performance and characteristics.
- Demonstrate an understanding of power systems including, internal combustion engines, jet engines, rocket engines, solar cells and nuclear power used in aviation/aerospace applications.
- Describe the important developments in commercial aviation following the war and how the world changed its attitudes toward passenger airlines.
- Recognize the major developments in air warfare during WWII and the impact of future aviation.
- Describe the major materials and methods of aircraft construction. Describe and demonstrate principles of navigation.
- Define the term general aviation and be able to recognize the major fields within the general aviation community.
- Define the terms manor, national, and regional airline. Know the most important and successful airplanes and their manufacturers.
- Describe various factors critical to aircraft performance.
- Understand the differences between fixed wing and rotary aircraft flight principles and characteristics.

Connections
- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)
- Federal Aviation Administration (FAA)
- National Science Teachers Association's (NSTA)

#210235- Introduction to Space Systems Engineering I
Valid Course Code
210235

Course Description: The course introduces students to satellites and space systems: orbital mechanics; the space environment; satellite application; spacecraft design consideration; the roles universities, industry and government play in space exploration, and future technologies of spacecraft's and satellites.

Content/Process

Students will
- Demonstrate an understanding of the history and development of aviation and space transportation.
- Demonstrate an understanding of power systems including, internal combustion engines, jet engines, rocket engines, solar cells and nuclear power used in aviation/aerospace applications.
- Describe the space environment and types of spacecraft.
- Demonstrate an understanding of electrical, mechanical, fluid, and pneumatic systems that could be used on/in aerospace environments.
- Demonstrate a knowledge and understanding of processing skills on materials and composites as they relate to aerospace technologies.
- Describe orbital motion and compute orbital elements and calculations.
- Explore the role of civilian spacecraft in the exploration and colonization of space.
- Acquire a number of technical skills that are in high demand in the workforce: the ability to work as a member of a team, to write good quality technical reports, and to give formal oral presentations.
- Attain extensive experience in computer programming, modeling, and data acquisition and analysis.
- Use computers and high-tech instrumentation to monitor and control technical systems, including the large structures of space tracking antennas.
- Be able to apply the basic principles of physics and engineering to solve technical problems.
- Develop an understanding of the core concepts of physics, space science, communications electronics, and mathematics.
- Demonstrate an understanding of the effects of flight as it relates to physiology.
- Demonstrate an understanding of career opportunities and requirements in the field of aerospace technologies.
-     Demonstrate science and mathematics knowledge and skills.
- Explore various career opportunities and requirements in the field of aerospace engineering, technicians, and scientists.
- Use oral and written communication skills in creating, expressing and interpreting information and ideas.
- Solve problems using critical thinking skills, creativity and innovation.
- Develop personal and professional leadership skills through participation in KY TSA

Connections

- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)
- Federal Aviation Administration (FAA)
- Morehead State University
- National Aeronautics and Space Administration (NASA)

Space System Engineering II
Valid Course Code
210236

Course Description: The course is a continuation to the study of Satellites and Space systems I, including satellite subsystems (telecommunication systems, power systems, attitude determination and control, and payloads), spacecraft structures, sensors, thermal considerations, manufacturing processes, pre-flight, launch integration, and ground segment.

Content/Process

Students will

- Demonstrate an understanding of the history and development of aviation and space transportation.
- Demonstrate an understanding of propulsion systems.
- Describe the space environment environmental controls.
- Demonstrate an understanding of electrical, mechanical, fluid, and pneumatic systems that could be used on/in aerospace environments.
- Describe various space-rated materials and structures utilized for spacecraft.
- Understand space vehicle control systems, attitude control, attitude determination, passive and active control systems.
- Demonstrate how manufacturing processes are utilized in space technology.
- Develop an understanding of launch procedures, payload requirements, pre-flight testing and flight operations.
- Describe orbital motion and compute orbital elements and calculations.
- Explore the role of civilian spacecraft in the exploration and colonization of space.
- Acquire a number of technical skills that are in high demand in the workforce: the ability to work as a member of a team, to write good quality technical reports, and to give formal oral presentations.
- Attain extensive experience in computer programming, modeling, and data acquisition and analysis.
- Use computers and high-tech instrumentation to monitor and control technical systems, including the large structures of space tracking antennas.
- Be able to apply the basic principles of physics and engineering to solve technical problems.
- Develop an understanding of the core concepts of physics, space science, communications electronics, and mathematics.
- Demonstrate an understanding of the effects of flight as it relates to physiology.
- Demonstrate an understanding of career opportunities and requirements in the field of aerospace technologies.
- Explore various career opportunities and requirements in the field of aerospace engineering, technicians, and scientists.
- Use oral and written communication skills in creating, expressing and interpreting information and ideas.
- Solve problems using critical thinking skills, creativity and innovation.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)
- Federal Aviation Administration (FAA)
- Morehead State University
- National Aeronautics and Space Administration (NASA)

Commercial Aviation Science
Valid Course Code
210237

Course Description: This course discusses the Federal Aviation Regulations covering the privileges, limitations, and operations of a commercial pilot, and the operations for which an air taxi/commercial operator, agricultural aircraft operator, and external load operator certificate, waiver, or exemption is required. The course also discusses the safe and efficient operation of airplanes, including inspection and certification requirements, operating limitations, high altitude operations and physiological considerations, loading computations, the significance of the use of airplane performance speeds, the computations involved in runway and obstacle clearance and cross wind component considerations, and cruise control.

Content/Process

Students will

- Demonstrate an understanding of the history and development of the Commercial aviation industry.
- Describe the commercial aviation industry environment.
- Describe and demonstrate an understanding of commercial pilot aerodynamics.
- Demonstrate an understanding of electrical, mechanical, fluid, and pneumatic systems that could be used on/in aviation/aerospace environments.
- Demonstrate an understanding of advanced aircraft systems to include turbine engines, hydraulic flight controls, environmental systems & GPS navigation.
- Demonstrate technical knowledge of the Air Traffic Control systems as it is related to commercial aviation technology.
- Demonstrate knowledge of Positive exchange of the flight controls procedures.
- Demonstrate a knowledge and understanding of processing Temporary flight restrictions (TFRs).
- Describe and demonstrate principles of ADM and risk management.
- Explore the role of the "Air Taxi" charter flight services.
- Describe various factors critical to aircraft performance in high performance aircraft.
- Demonstrate appropriate skills in analyzing and evaluating technological advancements as reported by the media.
- Demonstrate an understanding of the effects of flight as it relates to physiology.
- Perform advanced study and technical skills related to commercial aviation standards.
- Demonstrate an understanding of career opportunities and requirements in the field of the commercial aviation and commercial pilots.
- Demonstrate language arts knowledge and skills.
- Demonstrate mathematics knowledge and skills

- Demonstrate science knowledge and skills.
- Use oral and written communication skills in creating, expressing and interpreting information and ideas.
- Solve problems using critical thinking skills, creativity and innovation.
- Solve problems using critical thinking skills, creativity and innovation.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections
- International Technology Engineering and Education Association (ITEEA)
- Kentucky Occupational Skills Standard Assessment (KOSSA)
- Occupational Safety and Health Administration (OSHA) Standards
- American Red Cross Safety Training
- North American Board of Certified Energy Practitioners (NABCEP)

Foundations of Robotics
Valid Course Code
210238

Course Description: This course provides students with the foundation in content and skills associated with robotics and automation, including artificial intelligence, electronics, physics, and principles of engineering.

Content/Process

Students will

- Demonstrate an understanding of robotics, its history, applications, and evolution.
- Describe Artificial Intelligence (AI) and the forms of applied logic.
- Describe the role of sensors in the field of robotics.
- Demonstrate an understanding of the foundations of electronics.
- Describe the operation of basic electronic devices used in robotics.
- Demonstrate an understanding of engineering principles.
- Explain fundamental physics concepts applicable to the field of robotics.
- Demonstrate the safe and proper use of electronic and other lab equipment, tools, and materials.
- Build, program, and configure a robot to perform predefined tasks.
- Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
- Solve problems using critical thinking skills, creativity and innovation.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Robotics Design Essentials & Systems
Valid Course Code
210239

Course Description: This course provides students with content and skills essential to the design and operation of robotic systems. Students activities will include artificial intelligence specialized sensors, electronic applications, engineering technologies, environmental physics, manufacturing, topographical considerations, programming, motions physics, electric motors, communications, simulations, simulation and modeling, and critical thinking skills. *Prerequisite: Foundations of Robotics*

Content/Process

Students will
- Correlate elements of artificial intelligence to their functions in robotics.
- Describe the various classification schemes of sensors applicable to robotics.
- Explain how electronic devices are used in the operation of a robotic assembly.
- Demonstrate an understanding of various technologies used in the design of robotic assemblies.
- Demonstrate an understanding of advanced mathematics and physics associated with the design of a robotic assembly.
- Create a program to control a robotic mechanism.
- Describe the operation and use of various forms of electrical motors in robotic assemblies.
- Demonstrate an understanding of basic 3D modeling concepts.
- Analyze and apply data and measurements to solve problems and interpret documents.
- Design, build, program, and configure a robot to perform predefined tasks.
- Formulate scientifically investigable questions, construct investigations, collect and evaluate data, and develop scientific recommendations based on findings.
- Describe the approaches, challenges, and problem-solving methodologies involved with integrating artificial intelligence into robotic systems.
- Describe the role of specialized sensors in the design and operation of robotic systems.
- Describe the use of specialized electronic applications used in robotic systems.
- Demonstrate an understanding of the impact of robotics on the manufacturing process.
- Create a program to control a robotic system.
- Demonstrate an understanding of technologies for communication with and among robotic systems.
- Design, build, program, and configure a robot to perform predefined tasks.
- Solve problems using critical thinking skills, creativity and innovation.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections
- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Robotics Applications (Capstone)
Valid Course Code
210240

Course Description: This course provides students with extended and skills essential to the design and operation of autonomous robotic systems in the context of a capstone project. Students will design and build an autonomous robot to perform pre-designed tasks.
Prerequisite: Foundations of Robotics and Robotic Design

Content/Process

Students will

- Demonstrate an understanding of robotic applications (both stationary and mobile), their environments, and their unique design constraints.
- Design, build, program, and configure an autonomous robot to perform predefined tasks suitable for a particular robotic application.
- Successfully work as a member of a team
- Plan, organize, and carry out a project plan.
- Demonstrate safe and appropriate use of tools, machines, and materials in materials & processes technology.
- Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives through participation in KY TSA.
- Explain the importance of employability skill and entrepreneurship skills.
- Demonstrate personal money-management concepts, procedures, and strategies.
- Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
- Solve problems using critical thinking skills, creativity and innovation.
- Develop personal and professional leadership skills

Connections

- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Foundations of Energy
Valid Course Code
210341

Course Description: Foundations of Energy is a course in career and technical education for secondary students. The course provides an overview of renewable and nonrenewable energy resources reflecting how energy impacts the environment and the economy from regional, state, national and global perspectives. Extensive hands-on laboratory activities are vital components of the curriculum. This course can provide a basis for students working toward various career pathways in energy such as Engineering/Technology, Construction and Manufacturing Technology. Instruction should be enhanced through participation in Kentucky Technology Student Association challenges. *This course may be 18 to 36 weeks in duration.*

Content/Process

Students will:
- Identify new and emerging technology.
- Develop competencies and skills in the areas of energy.
- Engage in meaningful hands-on minds-on conceptual based activities in the areas of energy.
- Develop competencies in the safe and efficient use of the tools, machines, materials and processes of energy technology.
- Demonstrate employability and social skills relative to careers in energy industry.
- Apply concepts of mathematics, science, social studies, and communications in the context of energy.
- Understand electric power generation, transmission and distribution.

- Use computer-based skills related to concepts of energy in the various technologies.
- Demonstrate knowledge and skills in blueprint reading in energy technologies.
- Demonstrate and develop fundamental skills and knowledge of tools in the energy industry.
- Apply basic electricity concepts and knowledge as it applies to energy technologies.
- Describe similarities & differences between renewable and nonrenewable sources of energy.
- Develop core competencies in the area safety.
- Identify ways to conserve energy.
- Compare advantages and disadvantages in the use of the various energy sources.
- Assess the impact of the various energy sources on the economy in Kentucky.
- Differentiate between the terms energy and electricity.
- Describe the difference in potential and kinetic energy.
- Analyze how supply & demand impacts Kentucky's economy in relation to energy.
- Investigate the role of technology in the future development of energy usage.
- Map the major sources of energy used in Kentucky.
- Analyze the impact energy has on the environment.

Connections

- International Technology Engineering and Education Association (ITEEA)
- Kentucky Occupational Skills Standard Assessment (KOSSA)
- Occupational Safety and Health Administration (OSHA) Standards
- American Red Cross Safety Training
- North American Board of Certified Energy Practitioners (NABCEP)

Introduction to Alternative Energy
Valid Course Code
210242

Course Description: This course provides students with the foundation in content and skills associated with various energy sources, and electrical power generation, transmission, and distribution. Students will develop competencies in the area of energy history and the global impact of renewable and non-renewable resources; career opportunities; environmental principles, working with AC/DC electrical circuits, and transfer of various energy forms to produce DC current. Laboratory-based activities is an integral part of the course that includes safe use and application of appropriate technology, scientific testing and observation equipment.

Content/Process

Students will
- Summarize the value of alternative energy.
- Describe the importance of professional ethics and legal responsibilities with regards to alternative energy opportunities.
- Explain the significance of various alternative sources of energy.
- Demonstrate personal money-management concepts, procedures, and strategies for alternative energy use.
- Explain the significance and the pioneers in the field of developing energy alternatives.
- Identify how the characteristics of goal-directed research impact technology.
- Describe factors that motivate technological development (e.g. profit, function, form, quality, etc.).
- Learn about the differences between petroleum diesel and biodiesel and between the operation of a gasoline engine and a diesel engine.
- Trace the flow of energy through an ecosystem.
- Know the basic structure and characteristics of atoms, including how they bond.
- Analyze current and emerging issues (e.g., ethical, social, legal, environmental, political, and privacy) related to technology to identify appropriate and inappropriate applications of technology.
- Utilize Core Concepts of Technology to identify social, political, and environmental impacts of technology.
- Describe how electricity can be generated from radioactive sources.
- Design, construct, and assess alternative solutions to technological problems that minimize/alleviate negative impacts.
- Understand and utilize communications skills to plan for and accomplish objectives/goals.
- Work individually, in teams, or as a total class to solve design-related activities that incorporate Kentucky Core Content in the technological context.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections
- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

Alternative Energy II
Valid Course Code
210243

Course Description: This course provides students with the foundation in content and skills associated with various energy sources, and electrical power generation, transmission, and distribution. Students will develop competencies in the area of energy history and the global impact of renewable and non-renewable resources; career opportunities; environmental principles, working with AC/DC electrical circuits, and transfer of various energy forms to produce DC current. Laboratory-based activities is an integral part of the course that includes safe use and application of appropriate technology, scientific testing and observation equipment.
Prerequisite: Intro to Alternative Energy I

Content/Process

Students will

- Summarize the value of alternative energy.
- Demonstrate knowledge viability of biomass and biofuel.
- Describe the importance of professional ethics and legal responsibilities with regards to alternative energy opportunities.
- Explain the significance of various alternative sources of energy.
- Demonstrate personal money-management concepts, procedures, and strategies for alternative energy use.
- Explain the significance and the pioneers in the field of developing energy alternatives.
- Understand and utilize communications skills to plan for and accomplish objectives/goals.
- Identify how the characteristics of goal-directed research impact technology.
- Describe factors that motivate technological development (e.g. profit, function, form, quality, etc.).
- Understand that chemical bonds require energy to form, and release that energy when broken.
- Learn about the differences between petroleum diesel and biodiesel and between the operation of a gasoline engine and a diesel engine.
- Evaluate the pros and cons of biodiesel, and develop a persuasive argument for the use of biodiesel as an alternative to fossil fuels.
- Trace the flow of energy through an ecosystem.

- Know the basic structure and characteristics of atoms, including how they bond.
- Identify and explore the impacts (intended and unintended) of technological advancements in Agriculture and related biotechnologies, Energy and Power, Transportation, Technologies.
- Analyze current and emerging issues (e.g., ethical, social, legal, environmental, political, and privacy) related to technology to identify appropriate and inappropriate applications of technology.

- Explain and apply a system of problem-solving.
- Explore the ecological and economic impacts of unethical decisions (case studies and scenarios of regulation violations, whistle-blowing, kick-backs, pay-offs, labor disputes, illegal dumping, straight-pipe sewage, etc.).
- Utilize Core Concepts of Technology to identify social, political, and environmental impacts of technology.
- Design and fabricate evaluation tools (instruments, models, simulations, software) that assess the impact of products and systems through information collection and data synthesis.
- Explain the properties and atomic structure of radioactive elements.
- Describe how electricity can be generated from radioactive sources.
- Design, construct, and assess alternative solutions to technological problems that minimize/alleviate negative impacts.
- Demonstrate an understanding of careers in Energy Generations and Transmission/Distribution.
- Work individually, in teams, or as a total class to solve design-related activities that incorporate Kentucky Core Content in the technological context.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections
- International Technology Engineering and Education Association (ITEEA)
- Kentucky Occupational Skills Standard Assessment (KOSSA)
- Occupational Safety and Health Administration (OSHA) Standards
- American Red Cross Safety Training
- North American Board of Certified Energy Practitioners (NABCEP)

Special Topics in Engineering
Valid Course Code
210290

Course Description: Special Topics in Engineering allows the teacher to develop a course for in-depth exploration of specific engineering topics. This is a laboratory-based course design to study an engineering challenge, and/or recent technological advancements such as alternative energy, transportation, or other energy related fields. This study should include how this advancement affects society and/or environment. A culminating project integrating one or more of the contexts of the field of engineering and the Kentucky Core Content is encouraged. It should include research, design, construction, analysis, writing, and presenting. Instruction should be enriched through participation in Kentucky Technology Student Association or other engineering-related organization. This may be 18 to 36 weeks in duration.

Content/Process

Students will

- Apply concepts from science, technology, engineering, and mathematics (STEM) national standards and Kentucky Core Content.
- Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.
- Utilize the interactive (team) process for engineering design.
- Uses instruments to collect and analyze data.
- Identify current and emerging careers related to engineering.
- Develop proficiencies in the safe, efficient, and effective use of tools, machines, materials, and processes.
- Develop personal and professional leadership skills through participation in KY TSA.
- Develop proficiencies in the safe, efficient, and effective use of tools, machines, materials, and processes.
- Solve problems using critical thinking skills, creativity and innovation.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)

#219901 - Introduction To Engineering Design
Valid Course Code
219901

Course Description: This course provides instruction and experiences that develop foundational skills in engineering processes. Students gain skills in problem-solving by using a design development process. Models of product solutions are created, analyzed, and communicated using solid modeling computer design software.

This course may be 18 or 36 weeks in duration.

Content/Process

Students will
- Recognize how the History of Design (including artistic periods, styles, and form and function) influences product development.
- Use technical drawing tools, materials, and accurate measurement techniques to design and communicate products.
- Research information about professional engineering-related organizations.
- Identify career opportunities and educational requirements in mechanical, electronic-electrical, architectural engineering and construction (AE & C), technical illustration fields.
- Apply the design process involving problem identification, conceptualization, research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.

- Use principles and elements of design including portfolio development containing various written work, drawings, models, and other documentation.
- Perform sketching and visualization using proper techniques and tools to produce pictorial, annotated sketches, multi-view or orthographic drawings using proper and accurate measurements.
- Apply geometric relationships of forms and shapes, lines, various polygons, geometric constraints, Cartesian coordinate system, and origin planes.
- Perform modeling using conceptual, graphical, physical, mathematical, and computer generated techniques, including 3-dimensional software.
- Conduct model analysis and verification.
- Create model documentation including working drawings, dimensioning, and annotations.
- Develop product presentations using proper communication techniques and appropriate presentation aids.
- Define production issues such as designs for manufacturability, process planning, trends toward automated manufacturing, materials procurement, handling, and cost analysis, quality control, manpower and facility requirements and packaging.
- Apply marketing including product cost analysis, packaging requirements, and shipping.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections
Connections
• Kentucky Technology Student Association (KY TSA)
• International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
• Project Lead the Way
• National Technological Literacy Content Standards
• Secretary's Commission on Achieving Necessary Skills (SCANS)
• Kentucky Occupational Skill Standards (KOSSA)

Principles of Engineering
Valid Course Code
219902

Course Description: This course promotes a conceptual understanding of the engineering/engineering technology field. Exploring various technology systems and manufacturing processes help students learn how engineers and technicians use math, science and technology in an engineering problem solving process to benefit people. The course also addresses concerns about social and political consequences of technological change.

This course may be 18 or 36 weeks in duration.

Content/Process

Students will

- Define the various types of engineering.
- Apply a systems approach, research skills, (e.g., creative problem solving, critical thinking, teamwork, leadership, acceptance of personal responsibility), and a variety of resources including information, tools and materials to the resolution of a work-based or community-based problem.
- Apply communication and documentation including sketching, technical writing, data representation and presentation.
- Use the design process for product development involving problem identification, problem analysis, information gathering, alternative solutions and optimization, modeling, testing and evaluation, and presentation of solution.
- Define engineering systems including mechanisms, thermodynamics, fluid systems, electrical systems and control systems.
- Identify statics and strength of materials.
- Identify material classifications and properties utilizing appropriate testing methods.
- Use appropriate engineering methodology for maximizing product reliability.
- Define dynamics/kinematics including linear and trajectory motion.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and Science (ITEA-CATTS) Consortium
- Project Lead The Way
- National Technological Literacy Content Standards
- Secretary's Commission on Achieving Necessary Skills (SCANS)
- Kentucky Occupational Skill Standards (KOSSA)

Digital Electronics
Valid Course Code
219903

Course Description: This is a course in applied logic that encompasses the application of electronic circuits and devices. Students will become knowledgeable of electrical theory and be able to apply mathematical formulas to calculate circuit performance. Computer simulation software is used to design and test digital circuitry prior to the actual construction of circuits and devices.

This course may be 18 or 36 weeks in duration.

Content/Process

Students will
- Apply various number systems (hexadecimal, binary, etc.) and perform binary addition.
- Identify and define the fundamentals of electricity including safety, basic electron theory, prefixes, engineering notation, resistors, laws, circuits, capacitance, and analog and digital waveforms.
- Describe electronic gates.
- Use Boolean algebra involving Boolean expressions, logic simplifications, and duality of logic functions.
- Apply combinational circuit design including paradigm for combinational logic problems, specific application MSI gates and programmable logic devices (PLD).
- Identify flip-flops including sequential logic, j-k flip-flop, triggers, flip-flop timing considerations, and elementary applications of flip-flops.
- Apply shift registers and counters shift registers, asynchronous counters and synchronous counters.
- Identify families and specifications, logic families, and spec sheets.
- Use microprocessors and microcontrollers for interfacing with motors.
- Perform student-directed research involving design paradigms.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections
- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- Project Lead The Way
- National Technological Literacy Content Standards
- Secretary's Commission on Achieving Necessary Skills (SCANS)
- Kentucky Occupational Skill Standards (KOSSA)

Computer Integrated Manufacturing
Valid Course Code
219904

Course Description: This course builds on computer solid modeling skills developed in the Introduction to Engineering Design Course. Students use CAD software to design and develop a product and use CNC equipment to produce a mock-up or prototype. Fundamental concepts of computer integrated manufacturing (CIM) such as concurrent engineering, robotics, and cellular manufacturing are applied during the product development process. This course may be 18 or 36 weeks in duration.

Content/Process
Students will • Use computer modeling techniques including fundamentals of drawing such as object construction, parts modeling, creation of working drawings, assembly modeling, and rapid prototyping. • Explain the historical development and impacts of programmable machining and CNC equipment. • Identify CNC characteristics while utilizing CAM software, CNC programming, and operation of the CNC equipment. • Define robot characteristics of mechanical components, control systems, and programming methods used in industrial robot applications and automated manufacturing. • Define the types and components of CIM systems. • Evaluate the rationale for CIM manufacturing and the efficiency of CIM system applications. • Design CIM systems for product manufacturing. • Develop personal and professional leadership skills through participation in KY TSA. • Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections
• Kentucky Technology Student Association (KY TSA) • International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium • Project Lead The Way • National Technological Literacy Content Standards • Secretary's Commission on Achieving Necessary Skills (SCANS) • Kentucky Occupational Skill Standards (KOSSA)

Civil Engineering and Architecture
Valid Course Code
219905

Course Description: This course provides an overview of the fields of Civil Engineering and Architecture, while emphasizing the interrelationship and dependence of both fields on each other. Students use state-of-the-art software to solve real-world problems and communicate solutions to hands-on projects and activities. This course covers topics such as: o The Roles of Civil Engineers and Architects o Project Planning o Site Planning o Building Design o Project Documentation and Presentation This course may be 18 or 36 weeks in duration.
Content/Process
Students will • Define civil engineering and architecture. • Explain project design and project documentation. • Create project planning documentation including site information and development options. • Conduct site planning including grading, public ingress/egress, utilities, landscaping, water supply, and wastewater management. • Develop architecture plans reflecting various architectural styles that include floor plans, elevations, sections and details, schedules, HVAC, plumbing, and electrical systems, as well as communication and protection systems. • Define and evaluate structural engineering components including foundations, columns, beams, and roof systems. • Develop presentations of potential construction projects. • Develop personal and professional leadership skills through participation in KY TSA. • Apply concepts from Kentucky Core Concepts in the context of technology education.
Connections • Kentucky Technology Student Association (KY TSA) • International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium • Project Lead The Way • National Technological Literacy Content Standards • Secretary's Commission on Achieving Necessary Skills (SCANS) • Kentucky Occupational Skill Standards (KOSSA)

Districts that offer the following PLTW Pathway To Engineering (PTE) Program of Study
must have a Project Lead The Way STEM agreement.

Engineering Design and Development (Capstone)
Valid Course Code
219906

Course Description: This is a capstone course that culminates and applies concepts learned in previous PLTW courses. In this course, students work in teams to research, design, and construct a solution to an open-ended engineering problem. Students are guided by an engineer mentor. They must present progress reports, submit a final written report, and defend their solutions to a panel of outside reviewers at the end of the course.   This course may be 18 or 36 weeks in duration.

Content/Process

Students will
- Identify and define a problem appropriate for existing constraints.
- Conduct formal research consisting of daily research journals, the use of conventional library resources, using the Internet appropriately as a research tool, and identifying and communicating with subject-matter experts.
- Apply the engineering process to develop a possible solution to the selected problem.
- Evaluate the effectiveness and efficiency of the derived solution(s).
- Communicate findings through formal and informal presentations and written reports.
- Develop personal and professional leadership skills through participation in KY TSA.
- Apply concepts from Kentucky Core Concepts in the context of technology education.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- Project Lead The Way
- National Technological Literacy Content Standards
- Secretary's Commission on Achieving Necessary Skills (SCANS)
- Kentucky Occupational Skill Standards (KOSSA)

Districts that offer the following PLTW Pathway To Engineering (PTE) Program of Study must have a Project Lead The Way STEM agreement.

Aerospace Engineering
Valid Course Code
219907

Course Description: In this course, students conduct hands-on engineering projects developed through collaboration with NASA. Concepts of aerodynamics, astronautics, space-life sciences, and systems engineering are experienced. Intelligent vehicles such as the Mars rovers "Spirit" and "Opportunity" provide real-life applications of modern space exploration technology. This course may be 18 or 36 weeks in duration.

Content/Process

Students will

- Identify the various vehicles used for human flight.
- Identify and explain the forces acting on an airplane, how the main components of the airplane control these forces, and how changes to the design of the airplane affect performance.
- Use modeling and spreadsheet software to design and analyze data from various airfoil shapes.
- Identify the various instruments used to measure the lift and drag forces generated by an airfoil in a wind tunnel.
- Communicate test results through a technical report and a presentation to the class.
- Develop knowledge about the evolving technology of aerial navigation including VFR, IFR, VOR, Wide Area Augmentation System (WAAS), Local Area Augmentation Systems (L.A.A.S.), and Synthetic Vision systems to the Global Positioning System.
- Define terms and concepts of the design, flight, and forces on a rocket and be able to explain how they interact.
- Use trigonometry to calculate performance of rockets.
- Explain basic orbit theory satellite motion and orbit parameters.
- Work cooperatively in a team to design and conduct experiments related to positive G-force.
- Analyze various materials to determine their appropriate application in space craft.
- Design a computer-driven system for a robot to perform a series of predetermined functions without having anything impede its progress while successfully delivering a payload to a predetermined location.
- Design, build, and test an intelligent vehicle that will meet criteria determined by students.
- Develop personal and professional leadership skills through participation in KY TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and Science (ITEA-CATTS) Consortium
- Project Lead The Way
- National Technological Literacy Content Standards
- Secretary's Commission on Achieving Necessary Skills (SCANS)
- Kentucky Occupational Skill Standards (KOSSA)

Biotechnical Engineering
Valid Course Code

Course Description: This course addresses relevant concepts from the diverse fields of bio-technology, bio-engineering, bio-medical engineering, and bio-molecular engineering. Students will apply and concurrently develop secondary-level knowledge and skills in biology, physics, technology, and mathematics through project-based instruction.   This course may be 18 or 36 weeks in duration.

Content/Process

Students will
- Communicate ideas for designing a project using various drawing methods, sketches, graphics, or other media collected and documented.
- Follow laboratory safety procedures.
- Define the history and evolution of biotechnical engineering including impacts, both intended and unintended.
- Identify the fundamental concepts common to all major industries in biotechnical engineering.
- Predict future developments in biotechnical engineering.
- Explore relationship between financial markets and scientific research.
- Analyze the differences between values and morals, morals and ethics, and the variables that shape one's ethics.
- Create and test a public opinion survey on the bioethics of biotechnology and compile results.
- Investigate molecular techniques that are used by bioinformaticists.
- Analyze the technology utilized in the field of forensics.
- Apply the skills of reverse engineering to biotechnical engineering.
- Determine the proper techniques for isolating proteins.
- Conduct facial reconstruction and experience the role of a forensic artist.
- Determine the applications of fermentation in food production and renewable energy.
- Perform qualitative analysis of data as criteria for goal achievement.
- Perform on-the-spot repairs or modifications (troubleshooting) of equipment failure based on continuous monitoring of the system.
- Demonstrate the application of engineering design principles by improving upon existing hospital designs or surgical equipment designs.
- Demonstrate the application of product liability, product reliability, product reusability, and product failure.
- Research heart diseases and disorders.
- Research and create a set of improvements for imaging techniques.
- Design a portable ECG monitor and study the electrical aspects associated with the heart.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium
- Project Lead The Way
- National Technological Literacy Content Standards
- Secretary's Commission on Achieving Necessary Skills (SCANS)
- Kentucky Occupational Skill Standards (KOSSA)

219908

Special Topics in Engineering
Valid Course Code
219917

Course Description: Special Topics in Engineering allows the teacher to develop a course for in-depth exploration of specific engineering topics. This is a laboratory-based course designed to study an engineering challenge, and/or recent technological advancements such as alternative energy, transportation, or other energy-related fields.. This study should include how this advancement affects society and/or the environment. A culminating project integrating one or more of the contexts of the field of engineering and the Kentucky Core Content is encouraged. It should include research, design, construction, analysis, writing, and presenting. Instruction should be enriched through participation in Kentucky Technology Student Association or other engineering-related organization. This course may be 18 to 36 weeks in duration**.**

Content/Process
Students will   • Apply concepts from science, technology, engineering, and mathematics (STEM) national standards and Kentucky Core Content.   • Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.   • Utilize the interactive (team) process for engineering design.   • Uses instruments to collect and analyze data.   • Identify current and emerging careers related to engineering.   • Develop proficiencies in the safe, efficient, and effective use of tools, machines, materials, and processes.   • Develop personal and professional leadership skills through participation in KY TSA.   • Develop proficiencies in the safe, efficient, and effective use of tools, machines, materials, and processes.

Connections
• Kentucky Technology Student Association (KY TSA)   • International Technology Education Association Center for the Advancement of Teaching technology and   Science (ITEA-CATTS) Consortium   • Project Lead The Way   • National Technological Literacy Content Standards   • Secretary's Commission on Achieving Necessary Skills (SCANS)   • Kentucky Occupational Skill Standards (KOSSA)

Exploration of Construction Technology
Valid Course Code
210121

Course Description: An exploratory course and/or modules designed to investigate the types of activities performed in the construction industry and through laboratory experiences students explore the skills and technologies of this industry. Content includes the application of technology; the design of products and services; emerging and innovative technologies; safety and maintenance of technology; marketing; and technology-related career explorations. Activities may include computer aided design, mechanical drafting, building models of buildings, specific projects, using construction tools and machines and designing and building simple structures.

Content/Process

Students will

- Define the term of Technology.
- Apply concepts found in the Standards for Technological Literacy.
- Demonstrate and understanding of history of construction.
- Develop and appreciation of why construction technology is important to our society.
- Describe the essential systems and processes involved in construction.
- Identify materials and resources used in construction design, construct and test structural members with stress testing devices.
- Utilize the interactive (team) process for engineering design.
- Students will utilize basic principles of design through the use of mechanical drawing.
- Explore design techniques and develop basic skills with the use of CADD programs.
- Identify current and emerging careers related to construction technology.
- Develop a safe and functional level of skill, efficiency and effective use of technological tools, machines, instrumentation, material and processes.
- Understand and apply the technological method of inquiry and problem solving to produce and evaluation technological products and services.
- Purposefully integrate core subjects (math, science, history and English) matter in practical and technological life activities.
- Students will develop leadership and interpersonal problem-solving skills through participation in co-curricular activities associated with KY-TSA.

Connections

- Kentucky Technology Student Association (KY TSA)
- International Technology Education Association Center for the Advancement of Teaching technology and Science (ITEA-CATTS) Consortium
- National Technological Literacy Content Standards
- Kentucky Occupational Skill Standards (KOSSA)